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JOURNAL OF THE SOCIETY OF
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REVIEW

THE REVIEW.

In the first number of the Journal of the Society, which was published in January, 1882, it was stated that the object of the Council in publishing the Journal was primarily to establish a regular means of communication between the members of the Society and to supply the long-felt want in this country of a periodical specially adapted to the interests and requirements of the important industries dependent on chemical principles.

During the 36 years that have elapsed since this first publication of the Journal, these initial objects have been maintained and fostered with conspicuous success. Both by means of the original papers communicated to the Sections and by the complete character of the abstracted literature, the Journal has done much to promote the development of technical chemistry, and the large circulation that it now enjoys, both at home and abroad, is in itself sufficient evidence of its utility and reliability, and of the wisdom of its founders in not restricting its circulation to members only.

Within recent years, however, and especially during the period of the war, the field of chemical industry and the activities of those associated with its development, have been greatly extended. This awakened interest, which has been especially marked by a closer association between Science and Industry, has been fully recognised by the Council of the Society, and with the object of bringing the Journal into closer touch with these hopeful developments, it has been decided to extend its scope without disturbing the nature and individuality of the subject matter which has hitherto been included.

Apart from the original papers and abstracts, the Journal has always included a certain amount of other matter of general chemical interest, such as official and trade reports, and, more recently, notes on important industrial developments, short reviews of books, and a correspondence column, which has been used to a limited extent. Such material forms a part of the subject matter of chemical technology which is becoming of increasing interest and value. It stands, however, quite apart from the Transactions of the Sections and from the Abstracts, and it is from this standpoint that it has been considered desirable to make a special feature of this section of the Journal and to extend its scope very materially with the object of making it as complete a review as possible of such chemical and allied subjects as are likely to be of practical interest to the members of the Society.

The title "Review" has been selected for this section of the Journal. It will include articles of general and industrial interest, contributed by experts, official and trade reports, including Colonial and Foreign reports and orders, Parliamentary and legal news, company reports and signed reviews of the more important additions to chemical literature. In addition, reports of the meetings of the several Sections of the Society will be given in summary form, which it is hoped will serve as a helpful guide to the papers published in the Transactions and as a useful epitome for those who may not have the leisure available for reading the full papers at the time of publication. Further features will include reports of meetings of other societies, whenever the subject matter contains anything of chemical interest, and general news relating to the chemical and allied industries of Britain, Greater Britain and foreign countries, supplied as far as is possible by correspondents in the several Sections of the Society. A correspondence column will also be available in which suggestive and constructive proposals from members of the Society will always be acceptable.

The preparation of the Review has received the very careful consideration both of the Council and of the Publication Committee for several months past, and in making this addition to the scope of the Journal at a time when the chemical industries of the country have a great and unprecedented opportunity before them, it is hoped that a step forward has been taken that will prove a material help in their development.

THE ECONOMICS OF COAL PRODUCTION.

The custom of the London Section of the Society by which the opening meeting of the session is an occasion for an address by the President has again been amply justified. In choosing as his topic, "The Economics of Coal Production" (this J., 1917, 1209), Professor Louis not only selected a theme which he handled with the skill of a master, but one which, as he himself pointed out, lies about the very roots of the country's future industrial supremacy. Cheap coal means cheap energy, and whether this is required in thermal, electric or dynamic form, the cost of its production figures largely in all industrial operations. The chemical manufacturer who studies this address that he may learn how near are the possibilities of his fuel bill being reduced, cannot fail to be struck by the disclosure that, while the cost of coal is influenced by familiar factors, their effect differs considerably from what he imagined, and also by the likeness they bear to some of those which make up his own charges. The royalties claimed by the owner of the beds of raw material do not appear to constitute in themselves an important item, nor does it seem that the companies exploiting the mineral deposits take an unfair profit, having regard to the inclusion therein of due provision for the depreciation and ultimate exhaustion of the mines. The chemical manufacturer has to follow much the same course with his own plant. It would appear, then, that we must correct the prevalent impression that the coal-owner and the colliery company are in the main responsible for the price paid for coal. Professor Louis' figures disprove this and show

that we must turn our enquiries elsewhere in seeking for the answer. From the tables he has prepared it will be noticed that two-thirds of the cost is made up of labour and materials. Coal-mining, therefore, does not in these respects differ from most other industries, and improvements in economic coal production will largely depend upon how far we may be able to obtain the maximum return for expenditure incurred under these two heads.

Professor Louis is doubtless correct in his belief that wages will not in the future fall to their pre-war level. His anxiety, however, is not about the payment of these higher rates, but that labour does not respond to the impulse of increased remuneration by a proportionate increase in output. And this is a difficulty with which every employer is more or less envisaged.

One of the speakers referred to the need of education, probably having in mind not only those phases associated with school teaching, but also those pertaining to the broader principles of life. Considering the enormous share which the joint-stock company system has had in the development of the industrial resources of the country (though it has been far from faultless), should not some instruction in its principles be given to those for whom it provides a means of livelihood? The employees might then begin to consider that regulation (or reduction) of output as a function of their trade union was, as a means of producing industrial contentment, not nearly so reliable as an alternative by which they became partners in, and sharers of, the prosperity of the undertaking in which their lives were passed.

Another suggestive note in Professor Louis' admirable address was his proposal for more centralised methods of management. Here, again, we feel he is on the right line, and that a practice by which the coal industry of the country is carried on by various organisations, each with its own methods of working, of buying stores, and of maintaining plant, should be abandoned in favour of a system more adapted to present-day needs. The coal industry which, as Professor Louis rightly points out, is our greatest national asset, could then be conducted on scientific lines, not only technically but commercially, and the whole contents of mines properly dealt with and utilised.

One more reference to the address we cannot refrain from making. It has often been the fashion in this country to speak of Professors of Science as abstract dreamers, more or less out of touch or sympathy with the practical problems of life. The London Section has had an admirable example of the fallacy of that view, and in following the figures so lucidly set forth in Professor Louis' valuable address, not only they, but the members of the Society generally, must have been encouraged by the reflection how mutually interdependent are science and practice. Personally, we feel, after listening to his address, that our President's insight into the essentials of industry would be as invaluable in the control of a colliery as are his scientific attainments in the conduct of a college.

LA SOCIÉTÉ DE CHIMIE INDUSTRIELLE.

The influence of chemistry upon national security is a theme which no future historian can afford to ignore. Whilst the efforts of the Allies to develop their "key" industries appeal with especial force to chemists, the question of the future use of the experiences so recently acquired, and in many cases so dearly bought, continues to cause some anxiety, albeit favourable signs are by no means lacking. It was with peculiar gratification that the news of the foundation of a French society of industrial chemistry was received by chemists in this country some months ago, and by none with greater sincerity than by the members of our Society, particularly as the new organisation was to be given a constitution similar to that of the Society of Chemical Industry. Our members will be further gratified to hear that immediate steps were taken to get into communication with the new society, and that on the occasion of a recent visit to Paris, our President received a most cordial welcome from its officers, and returned with the impression that "La Société de Chimie Industrielle" was destined to become an organisation of first-rate importance. We feel confident that members will endorse our action in taking the first opportunity to extend the hand of welcome to the new Society, and in expressing the hope that the good feeling which has been established between the two headquarters may spread among the members generally, so that the chain which now unites the two nations may be strengthened and completed by the addition of a chemical link.

The letter from the President, M. Paul Kestner, to the chemists of France is reproduced in another column (p. 5), not only on account of its interesting nature, but also because it is a document which deserves a wider audience than that for which it was written. If the chemists of France needed such a stirring appeal, some of their colleagues in other lands need it also. The state of the French industry before the war was in many respects similar to that existing in this country; the causes which brought about the unhappy condition—neglect of science, exaggerated competition within and blindness to what was happening without—were the same in kind; and the two countries have now the common task of preparing for the day when the energies evoked by the war may be entirely diverted into channels of truly productive work.

THE PATENTS AND DESIGNS BILL.

This Bill was presented to the House of Commons by the President of the Board of Trade on November 19, 1917. The most important amendments of the previous Act of 1907 proposed by the new measure may be expressed briefly as follows :—

(1) Patents that are not being worked after they are four years old are to be subject to compulsory licences.

(2) A patentee may reduce the amount of the renewal fees by one half if he throws the patent open to anyone to obtain a licence on application to the Comptroller.

(3) Prior publication to be a ground of opposition to the grant of a patent.

(4) The life of the patent to be 15 years, or, in the event of international agreement, 16 years.

(5) A patent may be valid for one or more claims notwithstanding that another claim or other claims are invalid.

(6) Products of chemical processes or intended for food or for medicinal or surgical purposes may not be claimed, but only the processes of manufacture.

(7) Licenses at minimum royalty to be obtainable from the Comptroller under patents for inventions relating to food, medicine or surgical appliances.

(8) Assignments of and licences under patents or design registrations are not to be admitted as evidence in Court unless registered.

(9) Persons, firms and companies are forbidden to act as patent agents unless the person or each member of the firm or each director and the manager of the Company is a registered Patent Agent.

As was to be expected the foremost place is given to the so-called compulsory working. The first clause of the Bill repeals the existing Section 27 and the working of the patent abroad is no longer considered save as involved in importation into this country. The substituted section provides that a petition may be presented to the Comptroller for relief under the section on the ground that there has been an abuse of the "monopoly rights" under the patent.

These monopoly rights are abused: (1) if the patented invention is not being worked within the United Kingdom after four years from the date of the patent and no satisfactory reason is given; (2) if the working of the invention is being prevented or hindered by importation from abroad; (3) if the demand for the patented article is not being adequately and reasonably met; (4) if the patentee refuses to grant licences and trade is thereby prejudiced; (5) if any trade is unfairly prejudiced by the conditions attached by the patentee to the purchase, hire or use of the patented article or to the working of the invention.

The relief which the Comptroller may afford the petitioner who satisfies him that there has been abuse, includes: (1) a new conception called "licences of right"; the Comptroller may indorse the patent with these words whereupon certain results accrue which are set forth in the second clause of the Bill considered below, and any existing licensee may exchange his licence for a licence of right; (2) the Comptroller may grant a compulsory licence to the petitioner on such terms as he deems expedient including prohibition of importation on the part of the patentee and all existing licensees, and the petitioner thus licensed may call upon the patentee to sue infringers or may sue them himself, making the patentee a defendant; (3) if it appears to the Comptroller that the invention cannot be worked without capital which can only be raised by relying upon the monopoly, and the patentee will not undertake to find the capital, the Comptroller may grant the petitioner, if he will find the capital, an exclusive licence as referred to hereinafter; (4) the Comptroller may revoke the patent; (5) or may dismiss the petition.

The exclusive licence referred to above shall exclude the patentee from working, secure to the patentee a maximum royalty compatible with a reasonable profit to the licensee and guarantee a minimum yearly sum by way of royalty to the patentee. The licence shall be revocable if the licensee fails to expend the capital he undertook to find or to work the invention within the time specified. An existing licensee shall be preferred as the grantee of an exclusive licence. The Comptroller may order that the exclusive licensee shall compensate the patentee or any existing licensee for money or labour expended in exploiting the invention. The grant of the exclusive licence shall revoke all existing licensees.

The second clause of the Bill repeals Section 24 of the existing Act, which provides that if the reasonable requirements of the public with respect to the invention are not satisfied, the Board of Trade may grant a compulsory licence or revoke the patent; the reasonable requirements are transferred to Clause 1 of the present Bill as stated above, and this Clause 2 deals with the indorsement of the patent with the words "licenses of right as referred to in clause 1.

This indorsement may be made on the request of the patentee at any time after the sealing of the patent, with the following results: (1) Any person shall be entitled to a licence which may be settled between the patentee and the person, or, in default of agreement, by the Comptroller on application of either party; (2) in settling the terms of such licence the Comptroller shall try to secure (*a*) the maximum advantage to the patentee consistent with the invention being worked at a reasonable profit, (*b*) the widest possible use of the invention consistent with reasonable advantage to the patentee, and (*c*) equality of advantage among the several licensees and may to this end reduce royalties fixed under any existing licence, pioneer work by an existing licensee being taken into consideration; (3) a licence of right may preclude importation; (4) a licensee of right may call upon the patentee to take action against infringers or take such action himself, making the patentee a defendant; (5) if an infringer of the indorsed patent elect to take a license of right no injunction shall be granted against him and damages shall be limited to double the amount which would have been recoverable against him had the licence of right been of date prior to the earliest infringement, except when the infringement was importation; (6) renewal fees on indorsed patents to be reduced by one moiety.

A patentee may contract himself out of his right to have the patent indorsed and may have the indorsement cancelled if no licence exists.

Hitherto opposition to the grant of a patent by reason of the existence of a prior specification has been possible only if the invention in question has been claimed in that specification. Clause 4 of the Bill makes it possible to oppose on the ground that the invention has been published in any prior document, whether British specification or not. This, no doubt, is a concession to those who wish the Examiner's search to be extended to all publications; the Examiners search will remain as at present, but it will be open to any person to make a general search and oppose the grant on what is practically the ground that the invention is not novel.

When trouble has arisen between joint-applicants for a patent there has been no provision for granting the patent to one of them alone; Clause 5 removes this difficulty.

Clause 6 extends the term of the patent to 15 years and contemplates the possibility of some international agreement as to uniformity of term, in which case 16 years may be substituted for 15 years. Existing patents, accordingly are to have another year of life.

The important point about Clause 7 is that in considering a petition for the extension of the term of a patent the Court shall take into account any loss incurred by the patentee by reason of the war.

When a patent contained more than one claim the invalidity of any one of them made the whole patent invalid; Clause 8 alters this state of affairs by permitting the Court to grant relief in an action in respect of any claim or claims which it may find valid, whether other claims are valid or not.

Passing to Clause 11, in future specifications relating to articles or substances made by chemical processes or intended for medicinal or surgical use, may not contain claims for the substance itself but only for the special processes of manufacture. This appears to mean that chemical products cannot be patented as such, so that to prove infringement the plaintiff must prove that the patented process has been used in making the product.

Section 41 of the existing Act provides that the publication of an inventor's invention without his knowledge and consent prior to the date of his application for a patent shall not invalidate his patent. By Clause 13 of the Bill this provision shall not apply if the inventor has commercially worked his patent for more than six months prior to the said publication. This is not to apply to existing patents.

Clause 14 provides that a registered design may be cancelled on petition to the Comptroller showing that it is not novel or that it is used abroad and not in this country.

Heretofore assignees, licensees and others

acquiring interests in patents have been lax in registering the respective titles at the Patent Office. To remedy this, Clause 15 forbids the Court to admit the document in evidence unless it has been so registered.

The protection which the law affords the public against incompetent patent agents has been insufficient owing to the fact that those alone could be punished who *called* themselves "patent agents" when they were not registered. Such titles as "patent experts" did not fall within the judicial interpretation of "patent agents." Clause 17 amends the law by defining a patent agent as a person carrying on the business of obtaining patents in this country or elsewhere (irrespective of what he calls himself) and by providing punishment for any such patent agent not registered.

A Schedule to the Bill contains a number of minor alterations to the existing Act which deal mainly with Patent Office procedure of little interest to the general public.

THE PROFESSION OF CHEMISTRY.

Of the various weaknesses which have been brought to light during the recent period of national introspection, probably few have been more prejudicial than that of separatism, which is not to be confused with individualism in its true sense. This blemish has been particularly conspicuous in our trades and manufactures; it has not been altogether lacking in professional circles generally, and it has been perhaps especially prominent among those who practise chemistry. Atomism has proved a most useful creed for the co-ordination of chemical phenomena, but as a political principle for chemists it has failed badly. In spite of the undoubted benefits which have followed the efforts of other professional men to consolidate their interests and to show a united front, chemists, for the most part, have been content to plough their lonely furrows and to wait, Micawber-like, till something turned up to effect their union and cohesion. There is now a fair prospect that the monotonous period of "wait and see" is to be terminated. The meeting of some six hundred chemists at Manchester on November 10th, 1917, described as the largest gathering of the kind ever held in this country, marked the first important step in the direction of unity. The conception of initiating a national movement for the improvement of the professional status of the chemist is said to have originated in Birmingham some twelve months ago, and also independently, but at a somewhat later date, among the profession in Manchester. Then, fortuitously or otherwise, the prime movers came together and formed a Provisional Committee which drafted various proposals regarding the formation and objects of a "British Association of Chemists," and this Committee convened the meeting above mentioned. The resolutions submitted dealt with the desirability of forming the Association, the qualifications for membership, the objects of the Association and the best means of attaining them. The speakers included Dr. A. Rée (in the chair), Dr. R. B. Forster (Chairman of the Manchester Provisional District Committee), Mr. E. W. Smith (Chairman of the Birmingham District Provisional Committee), and Mr. Ed. White (President of the Pharmaceutical Society), Prof. G. T. Morgan, Prof. Findlay, representing the Council of the Institute of Chemistry.

Among the subjects discussed and the points made were: the difficulty of defining the word "chemist," the right to the use of this word by the pharmacists, according to the Pharmacy Acts of 1868 and 1908; the unnecessary multiplication of chemical societies; the good work accomplished by the Institute of Chemistry in the past, and the desirability that it should now open its doors and admit chemists of other qualifications than those now prescribed by it; and the urgent need that chemists should be incorporated in one body. The representatives of the Council of the Institute declared that that body was in sympathy with the objects of the proposed Association, that it would be quite prepared to consider the possibility of meeting the needs of chemists as expressed by the Provisional Committee; further, that no new Association was necessary, and that the Council would heartily welcome any deputation that might be sent by the meeting.

After a very lengthy discussion the following resolutions were passed by the meeting, each receiving nearly unanimous support:—

I. That it is desirable to form a British Association of Chemists, and that a *Provisional Society* be formed according to the terms specified on the form of application distributed at the meeting, membership of such *Society* to be confined to persons whose qualifications conform to the standard set forth on the form announcing this meeting.

II. That the objects of the *Association* be as follows:—

(A) To obtain power to act as sole registration authority for all chemists.

(B) To have the word "Chemist" legally re-defined.

(C) To safeguard the public by obtaining legislation ensuring that certain prescribed chemical operations be under the direct control of a chemist.

(D) To raise the profession of the chemist to its proper position among the other learned professions, so that it may attract the attention of a larger proportion of the best intellects and thereby secure a supply of highly trained chemists adequate to the industrial needs of the country.

III. That before incorporating this *Association* a Provisional Committee be appointed by this meeting:—

(A) To approach the Council of the Institute of Chemistry in order to explain the objects of this Association and to express the opinion of this meeting that these objects can best be attained by the Institute of Chemistry broadening its scope.

(B) To draw up a draft constitution.

(C) To obtain legal advice, requisite for drafting the Memorandum of Association for incorporation under the Companies Acts.

(D) To draw up a list of approved degrees and diplomas for interpreting clause I. (A) (of qualification for membership).

(E) To draft a form of application for membership (of the *Association*) and to receive applications.

(F) To arrange that the next general meeting be held within fourteen days of January 31st, 1918, to receive this Committee's report.

IV. That Provisional Committees of twelve members be formed in both the Manchester and Birmingham districts, and that these themselves shall form a National Provisional Committee to act until either the *Association* is incorporated or the Institute of Chemistry takes the Association over. Three representatives of each Committee shall form an executive acting for the members; this executive shall allocate the work of inauguration to the Birmingham and Manchester Committees.

V. That the Manchester and Birmingham Committees be authorised to proceed with the business referred to in Resolution III.

At the meeting of chemists of Liverpool and district, held on December 8th, under the Chairmanship of Prof. E. C. C. Baly, expression was given to the feeling that they wished to participate in the movement, and thought that action should be delayed until other districts had had time to organise and to elect their representatives; the executive work should not be confined to the representatives of the Manchester and Birmingham Sections. Dr. Rée and Mr. E. W. Smith assured the meeting that everything possible had been done to make the Manchester meeting a national one, and that in effect it was. There was no desire to exclude the representatives of other districts, and they took it upon themselves to act in a sense contrary to Resolutions IV. and V. (v. s.), and to ask the Liverpool chemists to elect a Committee of Twelve, and an Executive of Three, which would rank equally with the Birmingham and Manchester representatives; they further invited the Liverpool representatives to attend a meeting to be held on the following day at Crewe, when the case to be presented to the Institute was to be discussed. These proposals were adopted unanimously, and the Committee was elected forthwith.

Probably unaware of what had taken place at Liverpool, the members of the Newcastle Section of the Society of Chemical Industry met on December 12, and sent a telegram to the Institute asking it to delay action until the general feeling of chemists throughout Great Britain had been ascertained. A small committee was elected and a meeting of Northern chemists arranged for January 12th. The Nottingham chemists held a meeting on December 19th, and had the advantage of the presence of Mr. E. W. Smith. A resolution of sympathy with the movement was passed unanimously (see p. 8.)

Meanwhile, the combined executives had duly met the Council of the Institute on December 14th. The proceedings were private, but it is understood that considerable progress was made, and that there was a good prospect of the parties coming to terms. Further meetings will be necessary.

Such is a brief record of the movement up to date. There is no question that the chemists mean "business"; they have enthusiasm, a good cause, diplomatic and capable leaders, and it is probable that they will attain much of that for which they are asking.

The Institute of Chemistry, it will be generally acknowledged, has risen to the occasion, not by expressing platonic sympathy merely, but by taking immediate action. Some of its members are said to be opposed to the idea of allowing others to acquire more or less easily those honours which they have had to win by rigorous examinations. There is much of human nature in this attitude, but in view of the great benefits which stand to accrue to the profession as a whole, it is to be hoped that it will not be persisted in, particularly as a *modus vivendi* may not improbably be found. It would, for example, be possible for the Institute to establish one or more new grades of membership in order to provide for the admission of "industrial" chemists of different types. This course, however, would involve an alteration of its charter, and it would be doubtful policy to invite "the law's delays" at the present juncture. A more expeditious solution would be found in widening still further the qualifications for the Associateship whilst keeping those for the Fellowship at their present high level, or even advancing them. The latter seems the more feasible course; but one important knot would still remain to be unravelled, namely, the qualification for the A.I.C.—for some qualification there must be.

For the present it would appear advisable, in the case of honours graduates and holders of other recognised diplomas, to discard any idea of qualification by examination, and to admit to the Associateship all so qualified, and, in addition, others who can satisfy the Council that they are possessed of sufficient chemical knowledge and practical attainment (irrespective of the way these have been acquired) to justify their recognition as scientific chemists; and that they are personally desirable as members of the profession.

LA SOCIÉTÉ DE CHIMIE INDUSTRIELLE.

The following is a free translation of the open letter addressed by the President of this Society to the chemists of France:—

SIR,

It is an obvious truth that we were within an ace of being defeated by Chemistry, harnessed on so vast a scale by our enemies to their formidable industry and to their iniquitous barbarism.

During the course of this War, we have become painfully aware that Chemistry has lost the place of honour in our national life which it occupied only a few decades ago. Instruction in Chemistry had reached only a select few, and had come to be regarded—particularly in our great engineering schools—as an accessory, having little connection with economic studies generally. The profession of chemist was little respected and badly remunerated. In many cases, chemical industry showed itself indisposed to make either the financial or the scientific efforts required to maintain itself on a level with the German industry, and allowed itself to be beaten in competition and even supplanted on its own soil. There were, it is true, honourable exceptions, but the position, in its main features, was none the less disheartening.

The needs of Defence have called forth most praiseworthy efforts, which, we trust will one day be inscribed in the Book of Gold. We must see that this creative impulse does not fade away when we have achieved the victorious peace to which it will have contributed so powerfully; we must witness the re-birth of Chemistry as a great French science, and French chemical industry must choose the very best men for its representatives.

This is the task we have set ourselves. It demands the union and co-operation of all, near or far, who are in any way connected with industrial chemistry, Some of us had already planned an association similar to the Society of Chemical Industry before the War. This project, retaken in hand a few months ago, is now being realised in the foundation of the Société de Chimie Industrielle.

In France, there are already societies and publications connected with pure chemistry; others which specialise in certain branches of applied chemistry, and again others which have a purely commercial or a propagandist aim. We have no intention of following in the footsteps of any of these. Our object is to form an organisation that will cover all, in order to: (1) aid the development of French chemical industry in all its ramifications; (2) unite all the leaders of industry, professors, engineers, chemists, etc., who are interested in it; (3) assist the progress of industrial chemistry as much from the economic as from the scientific point of view. The means we shall employ are: the publication of a Review, which we shall develop to the fullest extent possible; the holding of congresses, conferences, competitions, exhibitions, etc.; the establishment of a bureau of industrial chemistry, the institution of a library, etc.

We are convinced that your sense of patriotism and a true appreciation of your own interests, will lead you to join our Society. You will find enclosed an extract from our Statutes, and a form of application for membership, which we ask you

to send in without delay; for we must not await the resumption of economic life to organise victory for our industry; we must take steps to ensure it now. We should also be obliged if you would communicate to us the names of those of your friends to whom our appeal might usefully be sent, and we should be grateful to acknowledge your help in this work of national importance.

Faithfully yours,
(Sgd.) P. KESTNER.

The officers of the Society comprise Professors A. Haller and H. le Chatelier (Hon. Presidents); M. Paul Kestner (President); MM. F. Binder, Duchemin, Matignon, and Staub (Vice-Presidents); M. Jean Gérard (Gen. Sec.); M. Engel (Asst. Sec.); Comte G. de Germiny (Treasurer); and M. Paul Schoellhammer (Librarian). The Council is composed of fifty-one of the most distinguished chemists, chemical engineers, and manufacturers in the country.

The Statutes of the Society provide for the enrolment of honorary members, of statutory members, and of associate members. To secure election by the Council, candidates must be introduced by two ordinary members. The annual subscription is 30 francs for members domiciled in France, and 35 francs for those residing elsewhere. Associate members are to be recruited from the ranks of the technical schools and universities, and their membership must terminate, or be converted into ordinary membership, within a maximum period of five years after their leaving these places of instruction. They are to enjoy all the privileges of full membership but they will have no vote, and they will be ineligible for candidature as members of Council. The annual fees in this case are 15 francs for France and 20 francs for foreign countries. The composition for life-membership is twenty times the annual subscription. Local branches may be formed on the initiative of the Council or on application by a minimum of thirty members residing in the locality; they will be controlled by local committees, which will be subservient to the Council. The offices of the Society are at 49, Rue des Mathurins, Paris.

OBITUARY.

R. M. HENDERSON OF BROXBURN.

Norman McFarlane Henderson, who for half a century was one of the leading men in the paraffin oil industry of Scotland, and a member of this Society since 1894, died on December 11 at Broxburn, West Lothian, at the age of 78.

At an early age he was apprenticed to a millwright, learning to work in wood, iron, brick and stone; he then became a pattern-maker to a foundry, and finally specialised in engineering. About 1861, when 22 years old, he was brought into close contact with James Young, the originator of the paraffin oil manufacture, and with his partner Edward Meldrum, at the Bathgate Chemical Works, where from the famous Torbanehill mineral crude oil was distilled and refined. He soon rose to become draughtsman to the works manager, A. C. Kirk, afterwards Dr. Kirk of shipbuilding fame. In this and future situations he had a unique experience in the renewal of old and the building of new oilworks. From 1869 to 1877 he was manager of the Oakbank Oil Company's works, where he was associated with William Kennedy, the managing director, and Sir George Beilby, who was chief chemist.

Henderson and Kennedy started the Broxburn Oil Company, Ltd., in 1877, the former becoming works manager and the latter managing director. Henderson had now full scope for his talents and his experience, and in due course he became a director of the company. Although his eyesight failed in 1896 he still carried out his duties, and it was not until 1912 that ill health compelled him to give up active management.

Henderson's first outstanding invention was his patent retort of 1873. The shale used at that time contained 12 per cent. or more of fixed carbon which was left in the spent material, and he showed how the latter could be used as fuel for the retorts. He also invented a continuous system of boiler-still distillation, which doubled the output, decreased the labour, and improved the distillates. This was also generally adopted. These inventions are described in the Journal of the Society, 1889, p. 100. After Young and Beilby had invented their method of retorting, Henderson had to apply the principle in a retort of his own (this J., Irvine, 1894, 1040, and Henderson, 1897, 984). He afterwards further improved the retort, increasing its length, so that the permanent gas from the distillation burned around the retort with sufficient heat to dispense with the use of coal. He had courage to do things on a large scale. In starting the Broxburn works in 1878, instead of using numerous small washers for the acid and alkali treatments as had hitherto been the custom, he built the vessels large enough to wash the whole day's quantity of any oil. Sweating the solid paraffin had been invented elsewhere and carried out in little dishes and hot-houses at a great expense of disagreeable labour. He carried it out, in a patented arrangement, on a large scale, reducing labour to a minimum; and the system was adopted all over the world (this J., Irvine, 1894, 1043). He patented later a cheaper plant, more easily renewable and of greater efficiency (this J., Henderson, 1911, 269). Henderson also patented a very efficient method of cooling and crystallising the paraffin mass in order to filter-press the heavy oil from the solid paraffin. In the early days of the industry the removal of the tars separated by the acid and alkali was a considerable expense and a great nuisance. On starting the Broxburn Works he devised a very efficient process for using these tars as fuel, after washing, by spraying them with superheated steam into the boiler-still furnaces, which effected a great saving. These are examples of Henderson's many inventions and arrangements by which he helped to prevent the total extinction of this important manufacture of which it was in great danger. Over 100 smaller works were wiped out and some millions of capital lost.

Henderson found time for all kinds of local service, filling among other offices that of Justice of the Peace and County Councillor.

D. R. STEUART.

On January 2, The Institution of Civil Engineers completed the hundredth year of its existence, having been established in 1818 at a meeting of eight engineers at the Kendal Coffee House in Fleet Street, E.C.

A useful list of War Trade Ministries, Departments, Commissions, and Committees, established since the beginning of the war, was given in the Board of Trade Journal for October 11, 1917.

Attention is drawn to German Patent No. 298,129, Cl. 81, of September 20, 1916, relating to the preparation of a cementing material for converting paper into fire-proof pasteboard. The cement is made by stirring chalk into potash water-glass containing 5—10% of free alkali, and the resulting mobile liquid is used for gumming together leaves of paper, which are afterwards dried. The pasteboard is very hard, can be washed, and is said to withstand high temperatures better than asbestos impregnated with ordinary water-glass.—(*Tropenpflanzer*, 1917, p. 199.)

PERSONALIA.

ORDER OF THE BRITISH EMPIRE.

Among the appointments the King has been pleased to make are the following :—

Knight Grand Cross (*G.B.E.*). Sir R. C. Garton.

Knights Commanders (*K.B.E.*). G. Jarmay, Esq., Dr. R. Robertson.

Commanders (*C.B.E.*). H. Glendinning, Esq., Prof. W. R. Hodgkinson, Prof. W. J. Pope, Prof. T. B. Wood.

Officers (*O.B.E.*). M. J. R. Dunstan, Esq., Dr. R. C. Farmer, Dr. J. A. Harker, P. J. Hinks, Esq., A. E. Holly, Esq.. Dr. T. M. Lowry, G. W. Macdonald, Esq., P. Matthey, Esq., Dr. O. E. Mott, Dr. E. J. Russell.

Member (*M.B.E.*). A. H. Dupré, Esq.

Mr. H. McGowan, of Nobel's Explosives Co., Ltd., has been appointed a member of the Council of the Association of British Chemical Manufacturers, *vice* the late Mr. R. D. Pullar.

Dr. R. S. Morrell, Chairman of the Birmingham Section of the Society of Chemical Industry, has been placed on the Advisory Board of the Flax Production Branch of the Board of Agriculture. Dr. J. V. Eyre has been appointed Technical Adviser to the Branch.

Captain G. R. Crosfield, formerly a director of Messrs. G. Crosfield and Sons, Warrington, is to be nominated as a Parliamentary candidate for Blackburn.

NEWS FROM THE SECTIONS.

MANCHESTER.

At the second meeting of the session held on December 7, a paper on "The Oxidation of Rubber" was read by Messrs. S. J. Peachey and Leon, Mr. Wm. Thomson presiding. The experiments described were in continuation of a previous research by the same authors (see this J., 1912, 1103), and dealt with the behaviour of purified rubber towards dry oxygen, the formation of carbon dioxide attending the oxidation, and the oxidation of vulcanised rubber and of balata. The rate of oxidation of rubber was determined by exposing a very thin film on the interior surface of a glass flask to oxygen at 85° C., and the results showed that the presence or absence of moisture had no appreciable influence. The amount of oxygen taken up was practically the same in both cases, as was also the quantity of carbon dioxide formed, this quantity being approximately equal to that of one-fourth of an atomic proportion of carbon per unit molecule of caoutchouc. Vulcanised rubber oxidised far less rapidly than raw rubber, but ultimately the same amount of oxygen was consumed; no sulphur dioxide was formed. Purified balata oxidised rapidly at first, but complete oxidation took three times as long as in the case of resin-free rubber. Purified plantation crêpe was oxidised continuously for six months by exposure to oxygen in shallow dishes in an electrically heated oven at 85° C., and after a very tedious separation, four products, all insoluble in water, were isolated and analysed: a yellow, viscid resin corresponding to the formula $C_{16}H_{26}O_3$; a faun-coloured amorphous solid of feebly acidic character, $C_6H_9O_2$; a brown amorphous substance, $C_{11}H_{16}O_4$; and a reddish brown amorphous solid, $C_6H_9O_2$. A short discussion then followed.

NEWCASTLE.

On December 12 last, Mr. Henry Peile (Chairman) presided over a well-attended meeting in the Bolbec Hall, Newcastle. Dr. J. T. Dunn read a short note on "The Melting Point of Coal Ash," in which he gave the results of a number of analyses of coal ashes, and showed the proportion of bases combined with a fixed weight of silica in each sample. The figures indicated that as a rule the melting point of the ash increased as the content of basic oxide diminished, *i.e.*, the better ashes contained a smaller proportion of bases.

Prof. H. Louis said that he felt convinced that it was not only a question of the amount of basic oxides but also of their composition. For instance, was the iron in the ferrous or ferric condition? Even supposing that ferric silicate existed (which was a very debatable point) it was certain to be a very infusible substance, whereas ferrous silicate was very easily fusible. Each silicate had its own melting point, but when complex silicates were considered, the question of eutectics came into play. He did not think that the question could easily be disposed of by the simple theory of molecular weights. Messrs. C. H. Ridsdale, S. H. Collins, G. Weyman, and H. D. Smith also took part in the discussion.

Mr. J. W. Craggs then read his paper on "Notes on Hardness Testing."

He said at the outset that he did not intend to discuss the problem of the cause of hardness but to review the present methods of testing and to show how each test really determined some special property now loosely termed hardness.

He grouped the present methods of testing under two headings :—

1. Indentation tests—
   - *a*. Brinell test.
   - *b*. Shore's scleroscope.
   - *c*. Pellin test.
2. Abrasion or scratch tests—
   - *a*. Turner's sclerometer.
   - *b*. Marten's sclerometer.
   - *c*. Saniter's abrasion test.

He described these in detail, pointing out the limitations of each, suggested that the different kinds of hardness should be more clearly defined, and proposed that the following terms be adopted :

> For the Brinell hardness, the Tenacity number; for the Scleroscope hardness, the Resilience number; for the Sclerometer hardness, the Penetration number: for the Saniter test, the Abrasion number.

Prof. Louis thanked the author for his endeavour to define more clearly what was meant by the term "hardness," and expressed his appreciation of many of the points that had been made. He had found the simple file test of great use in comparing chilled castings.

YORKSHIRE.

On Monday, December 17, 1917, the second meeting of the sesssion of the Yorkshire Section was held at the Queen's Hotel, Leeds, under the chairmanship of Prof. J. W. Cobb, Chairman of the Section. The principal business was the reading and discussion of two papers by Mr. Alfred Edwards, of the Leeds City Gas Dept., the first on "The Approximate Estimation of Tar Fog in Gas," the second "A Note upon Apparatus for the Determination of Boiling Points."

At the opening of the proceedings a resolution of sympathy with the family of the late Mr. D. H. Barraclough, a member of the Society, was passed.

Before reading his paper on "The Approximate Estimation of Tar Fog in Gas," Mr. Edwards mentioned that gas was generally produced now with a carbonising temperature in the retort of something like 900° C. and indicated its course through the different pieces of apparatus. By the time it had passed the exhaust the tar, carried by the gas, was in a very impalpable state, like fog; and it was this fog which caused difficulty to the gas engineer and coke-oven man, and even to the man concerned with the making of power gas.

At the appropriate points in the reading of the paper the author exhibited specimens of tar fog collected on filter paper and demonstrated the use of the density meter of Sanger, Shepherd and Co., in which the stains are balanced by a neutral tinted wedge graduated in Hurter and Driffield units. The value of the method lies in the comparative results it gives, the absolute figures being only approximate.

The Chairman endorsed the author's remarks concerning the difficulty of directly obtaining a satisfactory sample of tar fog. There was, he thought, an element of uncertainty in the method arising from the physical properties of the fog, from the likelihood of superposition of deposits on the filter paper, or from possible condensation upon the metal apparatus. Mr. J. Miller suggested the substitution of a cake of naphthalene for the filter paper in the sampling process, which could be afterwards dissolved with the collected tar for the density test—a suggestion subsequently approved by Prof. Cobb as likely to put the method upon a sound basis.

In replying upon the discussion, Mr. Edwards said that all his experiments had been made with cold gas, *i.e.*, with gas not more than 20° or 30° above air temperature, but that he intended, if possible, to make further experiments with hot gas. With reference to the superposition of tar particles on the filter paper in relation to results from tar suspended in liquid in a cell, this was the whole crux of the question, and he had not been able to satisfy himself upon it. He thought the Lovibond tintometer was fairly suitable for work of this kind, but not so handy as the density meter. He was much obliged to Mr. Miller for the suggestion as to the use of naphthalene instead of filter paper, which was very good if it could be well worked out.

With the note on apparatus for the determination of boiling points, Mr Edwards submitted for inspection the apparatus as devised or modified by himself. It provides for the full immersion of the thermometer stem, for an inner current of vapour protected from draughts by a jacket of vapour—between inner and outer tubes—and for the return of the condensed liquid to the flask below the thermometer.

Mr. F. Branson then exhibited and explained an apparatus used for the testing of gauges, and Mr. J. Miller demonstrated a method of rapidly determining dissolved oxygen in water—a modification of Lenossier's method devised by him (this J., 1914, 185, 1916, 457).

NOTTINGHAM.

British Association of Chemists.

At a meeting of the Nottingham Section, held at the University College on Wednesday, December 19, 1917, the Chairman of the Section, Dr. R. M. Caven, gave a short address, in which he drew attention to the anomalous use of the word "chemist" in this country, briefly reviewed the history of the Institute of Chemistry, and explained the purpose of the new Association, and its relation to the Institute.

The gathering was then resolved into a meeting of Nottingham and District chemists, under the same chairmanship; and Mr. E. W. Smith, of Birmingham, spoke at length of the Association and its dealings with the Institute. The promoters of the Association and the Council of the Institute had met in friendly intercourse, and alterations in the constitution of the Institute would very probably be made so as to qualify this body to absorb the new Association, and become the sole registration authority for British chemists. The alternative proposals before the Institute were: (a) that the Institute should form a third grade of members, besides those holding the qualifications of A.I.C. and F.I.C., for which all B.Sc.'s and others of equivalent training should be eligible, and so be recognised as "chemists"; (b) that the A.I.C. diploma should be given to all "chemists," as the hall-mark of their qualification.

The latter proposal seemed the more likely one to be accepted. Mr. Smith made plain the necessity of an amalgamation between the new Association and the Institute. Any antagonism which might alienate the Fellows of the Institute would be deplorable.

A discussion followed which was chiefly concerned with the interpretation of the term chemist, and the following resolution was passed unanimously :—

> "That this meeting of persons practising chemistry in Nottingham and district is in sympathy with the movement to form a British Association of Chemists; and, with the object of aiding the movement, will form a Committee to get into touch with and watch over the movement in their interests, and report to a subsequent meeting."

The following were elected on the Committee: Mr. L. Archbutt, Dr. Bowis, Mr. F. E. Carr, Dr. Caven, Dr. Hedley, Professor Kipping, Mr. S. Pentecost, Mr. J. M. Wilkie.

OFFICIAL NOTICES OF THE SOCIETY.

THE SOCIETY'S NEW OFFICES.

The headquarters of the Society are now removed from Broadway Chambers, Westminster, to

CENTRAL HOUSE,
46 & 47, FINSBURY SQUARE,
LONDON, E.C.2.

The telephone number is "LONDON WALL 7331," and the telegraphic address is "INDUCHEM FINSQUARE, LONDON."

SPECIAL NOTICES TO MEMBERS.

Members are reminded that the Annual Subscription due on 1st January is 30s., not 25s. as in the past (see Journal, September 15.)

Applications for the subscription were sent out with the Nov. 30 issue of the Journal, and to facilitate the work of despatching them a form was inserted in every member's copy. Those members who for any reason are not liable for payment of the subscription, or who have already paid it, are particularly asked to note this.

It is requested that cheques should be made payable to the "Honorary Treasurer" of the Society, and should be forwarded to him at the Society's Offices (see above).

COUNCIL MEETING.

The next Meeting of the Council will be held on Tuesday, January 22, at 2.30 p.m., in the Society's new offices.

DEATHS.

Forth, Henry, of Stoke Lacy, Marple, Cheshire, on October 28, 1917.

Gibbins, Captain Roland B., of 18, Wheeley's Lane, Birmingham. Killed in action, December 4, 1917.

Henderson, Norman M., of Broxburn Lodge, Broxburn, N.B., on December 14, 1917.

MEETINGS OF OTHER SOCIETIES.

THE FARADAY SOCIETY.

At the meeting held in the rooms of the Chemical Society on December 12, Mr. W. R. Bousfield, Vice-President, presiding, papers dealing with various applications of physical chemistry were discussed. Prof. A. W. Porter presented a study of the Thermal Properties of Sulphuric Acid and Oleum, a subject which is intimately connected with the efficiency of methods used for concentrating sulphuric acid. Existing data refer only to atmospheric temperatures, whereas concentration is now carried out at temperatures up to 200° C. and over. The required information is obtained by indirect methods from existing data, making use of thermodynamical relations. Pfaundler and Bünsted's figures are adopted for the heats of dilution of sulphuric acid, and these are combined with Thomsen's value for the heat of formation of sulphuric acid from sulphur trioxide and water. Henning's values are chosen for the latent heat of water. From these data the latent heat of evaporation of the solvent from solution is deduced, and expressions are arrived at from which can be calculated the total heat necessary to concentrate from any one strength to any other. These results are embodied both in a chart and in tables from which they are readily obtainable, the complete data available being summarised in an alignment chart. Similar data are deduced and evaluated for the condensation of sulphur trioxide in sulphuric acid of different strengths. Under the title of "Iso-piestic Solutions," Mr. W. R. Bousfield discussed the bearing of some experiments carried out by him to determine the relative degrees of hydration of solutions of different salts which, being confined in a common receptacle and evacuated to facilitate the exchange of vapour between the solutions, were subject to a common vapour pressure. The somewhat unexpected result was deduced that for a pure salt without water of crystallisation there is at every temperature a definite aqueous pressure between which the dry salt will not take up water, and will not, if it is not dry, become dried. The pressure may be called the "critical hydration pressure" of the salt at the given temperature. The fact should have considerable practical bearing on the manner of treating salts for handling in transit or storage. An interesting discussion tried to correlate Mr. Bousfield's observation, but not very successfully, with the known fact of the selective absorption for water vapour of wet phosphoric anhydride over the perfectly dry substance, when the two are side by side. This curious phenomenon, whether it be "explained" electrically, by adsorption, or by surface tension, is deserving of further investigation.

A paper by Dr. E. B. Ludlam on "The Haber Synthesis" described an attempt, which has had to remain incomplete, to effect the synthesis of nitrogen and hydrogen at atmospheric pressure by introducing hydrogen chloride, which it was hoped would displace the equilibrium in the direction of ammonia and would inhibit the reverse change by quickly removing the alkali. The results were negative, but it is possible that a catalyst might be found which would facilitate the synthesis in the way indicated. The only promising catalyst was iron, but the volatility of the ferrous chloride formed was a serious drawback. "The Poisoning Action of Carbon Monoxide in Catalytic Processes" was the record of a quantitative study by Dr. E. B. Maxted of the inhibitive action of carbon monoxide on the hydrogenation of olive oil in the presence of finely-divided nickel. The subject is of practical importance because hydrogen prepared from water-gas generally contains a little carbon monoxide. The first traces of the gas were found to have the greatest retarding influence, and as little as 1 per cent. was fatal to efficient hydrogenation. The discussion however brought out the fact that the physical state of the nickel may be an important factor, for Dr. Lessing has successfully used nickel carbonyl as a catalyst. In an interesting note by Dr. J. W. McBain on "The System of Recording Rate of Chemical Reaction," it was suggested that in the usual equation for expressing rate of reaction, the unit of time should be so selected that the value of the constant k should always be unity. This would give a simple physical meaning to the value of t, viz., that if the concentration were kept up to unity, it would take t minutes for 1 grm. mol. of the substance to react.

Mr. Alex. L. Feild, of the United States Bureau of Mines, described an experimental investigation of the viscosity of molten blast-furnace slag at furnace temperatures. The method employed—a modification of that of Margules—was to rotate a cylindrical crucible made of Acheson graphite and containing the molten slag, and to measure the torque exerted on an inner cylinder of graphite, the whole apparatus being contained in an electrically heated furnace. From the torque, the viscosity can be easily calculated, after making necessary corrections and calibrating the apparatus with a liquid of known viscosity. Using this method, the average viscosity of eight commercial slags at 1500° C. was found to be 301, that of water at 20° C. being taken as unity. The variation of viscosity with temperature was also studied. The importance of the matter to metallurgy lies in the fact that the desulphurisation value of a slag is a function of its viscosity, and if an insight into the mechanism of the former can be obtained, it should lead to improvements in the choice of slags, and hence in the efficiency of the blast furnace.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

On December 18, 1917, a paper was read by Mr. E. H. Cunningham Craig on "The Prospective Oilfields of Barbados." The geology of the island and surrounding district was described at some length, and the geological data led to the conclusion that there is little prospect of a great and prolific oilfield being discovered, yet there is every probability that moderate productions may be obtained in the most favourable localities. The prospects of establishing an oil industry in this West Inidan Island are far brighter than anyone would dare to suggest of the possible oil-fields of Great Britain. Up to the present fourteen wells have been drilled and also a number of shallow prospecting wells, and from the former the best year's production averaged about two barrels of oil per well per day. The oil is a fairly high grade petroleum of asphaltic base, mobile, and contains a good percentage of light oils.

SOCIETY OF GLASS TECHNOLOGY.

The December meeting was held in the University, Sheffield, on Wednesday, the 19th inst., Prof. W. G. Fearnsides presiding, when Professor P. G. H. Boswell contributed a paper upon "Resources of Potash suitable for Glass Making in the United Kingdom."

The minerals available as sources of potash may be divided into soluble salts, and insoluble salts. Up to the present no sources of soluble potash salts have been found in the British Isles

to replace those previously obtained from Stassfurt and Alsace. Among available insoluble salts may be mentioned felspar, mica, leucite, and glauconite, all of which are silicates.

The most productive source of potash is likely to be found in felspar which is useful for the alumina it contains as well as for the potash. Felspar as it occurs in granite is too finely divided to be picked out, but it is sometimes found near the margin of the granite or scattered in veins throughout its mass, when it is known as pegmatite. These veins, which vary in width from a few inches up to 40 ft., are a valuable source of potash, but unfortunately they are only found in the most inaccessible spots—the north-west of Scotland, the north-west of Ireland, and in Cornwall.

For pottery, felspar should be low in quartz, low in soda (to prevent crystallisation) and low in iron (to obtain good colour). The same features are necessary for glassmaking, and in addition there ought to be constancy of composition. Unfortunately this could never be realised. A potash content of 10 to 12 per cent. was desirable for glassmaking felspar, the soda content should not be more than 3% and the iron content not above 0·1%.

The chief deposits of felspar in Scotland are in the vicinity of Loch Laxford, Durness and Overscaig. In Ireland felspar is found at Belleck, Belmullet and Glenties, whilst good felsite is obtainable in Waterford and Wicklow, although its iron content is high. There seems little prospect of British felspar being placed on the market as cheaply as the pre-war Scandinavian supplies, owing to the cost of transport in this country, and also the higher price and different conditions of labour. It is hoped that a rich source of potash may be found in the flues of cement kilns and blast furnaces. Possibly it would be found expedient to augment the amount of potash in the flues of cement kilns by using felspar in the manufacture of cement.

A second paper was read by Joseph Kenworthy on "Bolsterstone Glass."

The history of glass making was traced from legendary times until its introduction into England. The subsequent vicissitudes of glass manufacture in this country were then dealt with more fully, leading up to the manufacture of glass in Bolsterstone, an out of the way spot in the Don Valley. The author had collected a large amount of information about this ancient and now long defunct industry. The first glass house at Bolsterstone seems to have been built about 1613 by George Fox, and after passing through various hands was closed down about 1750. It was in the heyday of its existence when worked by Robert Blackburn, and at that time was turning out very good glass of all varieties of table ware and domestic ware. Much of the glass made here has been lost or disseminated throughout the country, but some beautiful specimens both from point of colour and design are still in existence.

INSTITUTION OF MINING AND METALLURGY.

At the meeting of this Society held on December 20 an important paper was read by E. A. Ashcroft on "A Neglected Chemical Reaction and an Available Source of Potash." The reaction in question is that which occurs when finely crushed potash feldspar is heated with common salt at 900—1000° C., out of contact with air and moisture: $2NaCl + K_2OAl_2O_3(SiO)_6 = Na_2OAl_2O_3(SiO_2)_6 + 2KCl$. The products are insoluble sodium felspar (albite) and a mixture of neutral potassium and sodium chlorides, easily separated by lixiviation and fractional crystallisation. The reaction is reversible; to confine it to the desired direction, and to obtain the best (technical) yield of potassium chloride, equal weights of felspar and salt must be taken, and heated for 2 hours at 1000° C., when 86% of the total potash can be readily extracted. E. Bassett (1913) discovered the reaction, but he did not exclude air and moisture, nor recognise its reversibility. His patent was, apparently, never worked. The deposits of felspar on the N. W. coast of Sutherlandshire are admirably adapted for working, and are also very extensive. For emergency purposes, the process could be worked by using D-shaped gas-works retorts, having the flat side uppermost, made gas-tight with projecting iron end chambers, and arranged in ten panels of eight units, a stream of producer gas passing through each unit separately. With such a plant, 50 tons of 80% muriate could be produced daily (as much as can be recovered from all the 300 blast furnaces in the country), at an estimated all-in cost of £15—£20 per ton to-day, but not more than £7 per ton in normal times.

Dr. P. C. H. Boswell, in opening the discussion, said the paper was worthy of the widest publicity. It was the general impression that there was no market for soda or soda lime felspars, but it was in demand for glass making owing to the alumina it contained. It was particularly suitable for resistance glass, thermometers, and for bottles where strength of neck was required. British felspars had been little used in the past because of their high iron content. The author had now demonstrated how a soda felspar could be obtained as a by-product. Regarding the economic aspect of the process, he thought the author was perhaps a little too sanguine about the deposits. He could not agree that the Durness deposit was readily accessible. Owing to the frequent presence of quartz in the veins of pegmatite, the actual cost of working, without handpicking, would exceed 2s. 6d. per ton. The situation around Durness was difficult on account of the bog and the sandy character of the roads; the deposit further south near Laxford Bridge was more accessible and the harbourage was better. Many of the West Irish deposits could be worked at less expense, but wherever British felspars were plentiful, they were in most inaccessible spots. He did not think the average of British felspars contained 10% of potash. From the analyses of 30 samples, collected by himself, he would put the figure as not higher than 8—9%. Supposing such a felspar were delivered to works at 16s. a ton, the cost of the potash content would be £10 a ton, before crushing or other work was done upon it. That was the flat rate at which potash was sold by Germany to this country before the War. The nearest works to the felspar deposits where it could be dealt with was at Belfast Lough. He had been asked to deliver felspar there at a maximum price of 10s. per ton. The normal rate of freight alone, without crushing, would be at least 6s.; at the present time it would be nearer 25s—30s., and after the war it would probably be double what it was before. The combined costs of working and transport was the determining factor. He had studied the question of working the material near the seat of occurrence, and also of utilising water power for crushing purposes; but both these propositions were too expensive. He was forced to the conclusion that, failing the discovery of soluble potash in these Islands, we should have to depend upon such sources as flue dust from gas ovens, blast furnaces, cement works, and so on. They might combine the two ideas by adding feldspar to the cement or other raw materials, but at the present moment it was

very difficult to get firms to put down a big recovery plant if they had no guarantee that the after-war price of potash would exceed 10s. per ton.

Mr. H. L. Sulman expressed the opinion that after the war conditions would be established which would lead to a profitable potash industry, and indicated the analogy between the " neglected reaction " and that shown by zeolites and permutites.

Dr. O. J. Stannard thought there would be great difficulty in maintaining an even temperature throughout the reacting mass in the author's process, and that it would not be easy to exclude air and moisture in a commercial plant. He regarded the Sutherlandshire deposits as suitable for exploitation. Concerning the use of iron vessels for the reaction, he had found that, after some time, salt had a tendency to soak into and through iron vessels and destroy them at 1000° C. The author's method was well worth a trial on a commercial scale.

Prof. C. G. Cullis inclined to the opinion that the pegmatite mentioned would be found to average less than 8% of potash, and he considered the estimated costs to be too low. Much work had been done in America on the extraction of potash from felspars, but not a single process there devised had been worked on a commercial hais. The view prevailing there was that no process could be successful unless it produced a marketable by-product in addition to the potash, and he was of the same opinion. There was a possibility that aluminium might be obtained from feldspar after the potash had been extracted.

Mr. Rhodin said that he had been working on the problem since 1898, and two years ago he had satisfied a Sub-Committee of the Board of Agriculture as to the feasibility of his process of heating powdered felspar, common salt, and lime mixed in the ratio of 100 : 40 : 40, the lime being previously slaked in order to introduce steam which he had found to be necessary The lime did not lead to the formation of calcium chloride, and the solutions obtained were always alkaline. It was impossible to think that the actual production of potash would pay in peace time. Analysis of the Lake Eireboll felspar made in the Government laboratory had shown it to contain 8·6% of potash, and a very large amount of manganese and iron.

Prof. H. Louis said that the author had omitted to mention the best source of potash felspar, viz., Southern Norway, where magnificent pegmatite deposits occurred close to a tidal water, and where cheap water-power was abundant. Norwegian felspar was used in coal washing in this country, and if experimenters wished for a plentiful supply they could not do better than utilise the scrap material from the washers.

In his reply on the discussion, Mr. Ashcroft said that the kind of mining he had in mind was the quarrying practised in making railway cuttings, where two tons to the cubic yard were removed at a cost of 1s. to 1s. 8d. per cub. yd. Attempts to find a workable process of potash extraction yielding a marketable by-product had failed because such processes involved greater complexity and led to the introduction of additional limiting factors. He did not agree with the figures given for the analysis of Lake Eireboll felspar, and was convinced that his estimate of an 8% potash content was not too high. With the aid of a platinum-rhodium pyrometer, he had found that the passage of heat from the outer to the inner walls was 10 times as fast as that in an ordinary gas retort. The heated felspar was an exceedingly good conductor. Calcium and magnesium chlorides were present in the lixiviated material but only in exceedingly small quantities, and the resulting solutions were absolutely neutral. The addition of lime to the charge would not only appreciably augment the cost, but was quite unnecessary.

NEWS AND NOTES.

AUSTRALIA.

A rich discovery of bismuth, wolfram, and molybdenite is reported in the Jingera Mountains, New South Wales, with reefs from 3 to 4 ft. 6 in. wide.

Mr. Jensen, Minister of Customs, has ordered the winding up of the Australian Metal Company, Ltd.

Good progress has been made with carbide and zinc electrode works near Hobart. The carbide works, capable of producing 5000 tons yearly, have been completed.

A fire at South Melbourne on December 3rd last destroyed Bloggs' Chemical Factory and damaged the premises of the Electric Equipment Manufacturers. The total damage is estimated at £15.000.

CANADA.

Reports of yet another gold discovery in the district of Abitibi have reached Cobalt, Ontario. A prospector who has returned from the scene of the discovery states that a vein, in which occurs a considerable amount of free gold, has been uncovered, and that the prospective area in the vicinity is a large one. Reports of new discoveries are becoming so common of late that interest in the information seems to be waning, although a number of excellent showings were uncovered during the past summer and warrant further investigation.

An American chemical company is establishing the necessary machinery, etc., for the manufacture of potash from kelp on Queen Charlotte Island. In addition to the manufacture of potash, the Company proposes to extract oil from non-edible fish, and also to make fertilisers from the residue after the process of oil extraction. All edible fish caught by the Company's boats will be placed in its cold storage plant and sent in weekly shipments to Prince Rupert for packing. The Company is stated to be the possessor of licences from the British Columbia Government on what are said to be the most extensive kelp beds on the Pacific coast. They are situated in Cumshewa Inlet, Moresby Island, and cover about ten square miles. The plant will have facilities for handling 1000 tons of wet kelp per day.

Negotiations are being conducted between the Canadian Nufuel Company, of Regina, and the Regina City Commissioners for the manufacture of the new fuel " Oakole " from that city's garbage and refuse. The patentee of this new fuel is an American chemist, and a citizen of Regina has secured the selling and manufacturing rights for Canada and Newfoundland. At the present time this new fuel is being manufactured at San Antonio and Austin, Texas, and a large plant, having a capacity of 250 tons of fuel a day, has been opened at Pueblo, Arizona. It is proposed to erect a plant having a capacity of 150 tons a day at Regina.

* * *

The Imperial Trade Correspondent at Winnipeg has forwarded a copy of a Bulletin, issued by the Legislature of Manitoba, in which are discussed the molybdenite prospects in the Falcon Lake district in that Province. Dealing with the economic possibilities of the district, the writer of the article, who is an official of the Department of

Geology and Mineralogy at the University of Manitoba, states that it may be said that molybdenite has been found over a considerable area in the district. Owing to the manner of occurrence of the mineral and its tendency to irregular distribution, it is almost impossible to judge of the mineral content of the ore, as seen on the dumps or in the excavations. It was judged from a hasty inspection of these that the molybdenite content in most cases would be measured in tenths of 1%. Sampling for analysis is almost impossible without excavating and crushing on a large scale. It can be said, however, that molybdenite is fairly generally distributed throughout the pegmatites, and so far as can be judged from excavations already made, in quantities sufficient at least to encourage further development and prospecting on the properties already staked, and in other parts of the district.—(*Bd. of Trade J., Dec.* 20, 1917.)

SOUTH AFRICA.

Practically the whole of the Union's cement requirements are now being met by the local factories.

A very successful soap factory has been established at Lourenco Marques, chiefly with Transvaal capital.

The recovery of arsenic is being undertaken locally, and with the contribution which Rhodesia is expected to make shortly, South Africa should in the near future be largely independent of outside sources for its supplies of arsenite of soda and other arsenical compounds.

The Department of Industries is advised that it has been de ided to reopen the glass bottle factory at Hatherley (Pretoria) as soon as certain technical difficulties have been overcome. A sample of sand from the Bot River District, Cape Province, was recently examined at the office of the Director of Geological Survey, and proved quite a suitable material for glass manufacture.

South African hides are thick and plump, and therefore much more suitable for sole leather than the thin spready Australian hide, but for harness and upper leather the latter is superior. With the possible exception of the Scotch skin, nothing can beat the pure Cape skin for strength and texture, which is eminently suitable for gloves and similar leather. South African hides and skins are, as a rule, quite as good as those from other parts of the world, but the bad flaying and the frequency of brands and scratches detract considerably from their value. Given a hide free from these defects, and using the same care and attention as employed in England, these is no reason why the resulting leather should not be quite equal to the best English tannages.

Prof. P. A. Wagner has arrived at the conclusion that although the possibility of the existence of valuable liquid petroleum cannot be finally dismissed, there is little likelihood of an important discovery being made. The beds of oil shale hitherto discovered are thin in comparison with those being worked in Scotland and France, and are not very rich. Up to the present only one small area, situated in the north-east of the Utrecht District of Natal, appears to have been properly examined, and, if the figures published can be accepted, there is a sufficient tonnage of workable shale to warrant the erection of plant capable of treating 300 tons per diem. It is suggested that a representative sample of 40—50 tons should be sent to an experimental plant in Scotland to be thoroughly investigated before large scale-operations are started.—(*South African J. Ind., Oct.*, 1917.)

GENERAL.

Imports of sulphur.—U.K. imports of pyrites or copper ore before the war amounted to 900,000 tons, mostly from Spain with small amounts from Newfoundland. Since the war broke out Canada has supplied from 250,000 to 300,000 tons per annum. The total amount of sulphur obtained in a pure state is about 800,000 tons per annum, half of which comes from Sicily and the U.S.A., Japan and Spain also furnishing large supplies. There are considerable deposits in New Zealand, but distance from markets, labour troubles, and inadequate machinery led to the abandonment of the mines. Attempts have been made to work the New Zealand mines during the war but without success. Since Australia imports about 20,000 tons per annum it would seem that there is here a convenient outlet for the New Zealand product. Canada also imports about 25,000 tons yearly. Even New Zealand, although she has supplies of her own, imports sulphur from Japan. South Africa imports from Spain and Italy to the extent of 17,500 tons.—(Statist, Dec. 29, 1917.

Potash recovery.—The statement that has recently been circulated to the effect that the Ebbw Vale Steel, Iron and Coal Company, Ltd., has embarked upon an expenditure of £250,000 for the erection of plant to recover potash from the blast furnace gases, is erroneous. The sum mentioned is to be spent upon general extension, which includes a standard Halbert-Beth gas-cleaning plant for filtering the dust containing the potassium compounds. Additional plant for the extraction and concentration of these compounds is also in contemplation, but particulars will not be available until it has been installed.

Fuel conservation.—Nottingham is interested in the projected Government Power Centres, and its Council is making an effort to secure the establishment of one of these centres near the city.

At a recent meeting of the Council (December 2), Mr. Atkey proposed to approach the Government on the subject, and a small committee consisting of members of the Council and others was appointed to assist the Government locally in carrying out the scheme.

Subsequently the Corporation of Newark has become impressed with the importance of the matter, and proposes to take steps to be linked up with Nottingham, in the hope that one of the 20 Government power stations to be erected may be placed somewhere between Newark and Nottingham.

Applied chemistry at Leeds University.—We learn from Leeds University that important developments are in hand in the Department of Colour Chemistry and Dyeing. Under the direction of the new Principal (Prof. A. G. Perkin), a new laboratory is being equipped for teaching practical dyeing; the dyehouse is being partly reorganised, and it is intended to make a special feature of the dyeing of artificial silks.

Recently the head of the Department of Coal Gas and Fuel Industries (Prof. J. W. Cobb) received intimation of an intended gift to the Department by Mr. Henry Woodall, jun., of a complete carbonising, washing and purifying plant, as a memorial of his late father. The plant will be a valuable addition to the equipment of the Department, both for training and research.

Potash in the U.S.A.—The reports received by the United States Geological Survey concerning the production of potash during the first six months of 1917, show that more was produced during this period than for the whole of the previous year, and it is estimated that the yield for this year will be about 2½ times that of 1916. The following are

the returns for January to June, 1917, given in units of available potash (K_2O), a unit being 1 per cent. of potash in a ton of the material: Natural salts or brines (chiefly from the Nebraska Alkali Lakes), 7749; alunite and dust from cement mills and blast furnaces, 1867; kelp, 2143; distillery slop, wool washings and miscellaneous industrial wastes, 2153; wood ashes (returns incomplete), 111. It will be noted that no return is given of potash extracted from felspar or other silicate rocks. The production from kelp, about 15 per cent. of the whole, was about the same as in the previous year.

The Margarine Industry in Holland.—The 1916 Year-Book of the Chamber of Commerce at Rotterdam states that 30,000 metric tons (1000 kilos.) of animal and vegetable margarine are consumed every year in Holland, and that the ratio of export is normally five times that of the consumption or 150,000 tons out of a total production of 180,000 tons in 1916.

Practically all vegetable and animal fats can be used in making margarine. The principal are: *Vegetable*—cotton seed, pea nuts, sesamé, soya beans, palm kernels, rapeseed, linseed, kapok seed, and copra: *Animal*—oleo oil, oleo stock, tallow, neutral lard, imitation natural lard, butter, and milk. Salt water is always mixed with the various ingredients. Deodorising machinery has been developed in Germany and Holland to an extraordinary degree, so that many oils and fats of no use elsewhere, can be introduced without harm.

There are about 30 principal margarine manufacturers in Holland, but of these several have recently been bought up by Jurgens' Margarinefabrieken, Oss, with headquarters in North Brabant.—(*Bull. Fed. Brit, Ind.*, No. 18, 1917.)

Wolframite ore in South China.—According to a recent American consular report wolframite ore is found in marketable quantities in Kwangtung Province, and American merchants are said to be interesting themselves in the matter. Much of it has hitherto been mistaken for manganese or iron ore and the real nature of the mineral was not recognised until recently. Most of the ore at present comes from Chengchow, Hunan Province, adjoining the borders of Kwangtung. All the mining is done by hand and the ore is carried by men to Ping Shek, a distance of about 60 miles. Many buyers do not wait for the ore to reach Canton, and have established headquarters at Lok Chong, a small town on the West Bank of the North River, 40 miles above Shiuchow, where they are able to intercept the cargoes and get first choice from the middleman who has bought up the ore. The middleman daily collects the goods direct from the miners in varying small amounts. The Fu Min Co., which has a claim at Waichow, on the East River, permits the natives to mine in the concession, but insists on the exclusive right to buy the product. The current prices paid for the ore to the miners is about $20 gold per cwt., and the company obtains about $32 gold at Canton. The number of miners engaged in this enterprise varies between 1000 and 2000. The method of mining is principally hand placering. The ore runs from mere dust to the size of walnuts or larger, and it is also found as "floats" or decomposed products on the hillsides, where the earth is dug and washed for it. A small sample of the ore from Waichow district, analysed recently, contained 55·84% tungsten, 13·25% iron, and 11·56% manganese. This sample gives a general idea of the nature of the ore

German chemical works in 1916.—The number of chemical factories in Germany in 1916 was 14,993 as compared with 14,914 in the previous year. These factories employed 256,420 full-time workers (16·74% more than in 1915) who put in 76,725,151 hours (compared with 65,670,000). The total number of full-time and part-time workers rose by over 88,000 to 631,816. The increases were largely due to the replacement of men called up for active service by a necessarily greater number of women, boys, and girls. Before the war about 40% of the works were inspected, but many fewer inspections are now carried out, chiefly because the staff is engaged on other more imperative business. The accident roll is on the increase, reported accidents increasing from 12,401 in 1915 to 14,908 in 1916, accidents for which compensation was paid from 1549 to 2058, and deaths from 299 to 389; but if these figures be compared with those of a pre-war year when the number of full-time workers was approximately the same as in 1916, it is seen that the increases are relatively small. Accidents due to poisonous gases and nitro-compounds were especially prominent in 1916, but the conditions of work are being much improved, notably by the use of respirators, impervious gloves and better ventilation, by securing moderation in the consumption of alcohol and tobacco, and above all, by increased attention to personal cleanliness. In the following table are given the number of inspected and controlled factories, and the number of full-time workers employed in them, the places named representing districts:—

	Factories.	Workers.
Berlin	2388	29,007
Breslau	1238	12,349
Hamburg	1979	37,372
Cologne	2444	63,688
Leipzig	2499	45,605
Mannheim	1740	30,184
Frankfort a/M	1054	23,397
Nürnberg	1651	14,818
Totals	14,993	256,420

—(*Chem. Zeit.*, 1917, 747.)

Chemical Industry in Japan.—M. Oka, Chief of the Commercial and Industrial Bureau, has recently made the following statements concerning the progress of the chemical industries of Japan. The most important developments have taken place in the manufacture of dyes, and of sodium and nitrogen compounds. Under the provisions of the Dye-stuff and Chemical Manufacture Encouragement Act, the Japanese Government has established the Japan Dye-stuff Manufacturing Co., which, within 18 months, erected a large plant at the mouth of the Aji-kawa, Osaka, and is now working on a large scale. The Asahi Glass Co., after six months of research work, was able to turn out satisfactory quantities of soda glass; and very good results have been obtained by the Taiwan Fertiliser Factory, although some time must elapse before the required national demand of 50,000 tons per annum of artificial fertilisers can be satisfied. In the nitrogen industry, conspicuous work is being done by the Japan Nitrogenous Fertiliser Co., and by the Electrical Chemical Manufacturing Co., which is using the Ostwald process. The nitrogen content of Japanese coal is very low. Therefore there is additional need to develop synthetic processes. The cheap fish and soya bean oils were formerly exported, but are now being refined and used in the manufacture of food products. Other industries which have made marked strides are those connected with drugs and medicines, celluloid, enamelled ware, etc., but perhaps the greatest progress has been made in the production of potassium chlorate, phosphorus, caustic soda, and bleaching powder, which are nearing the stage when exportation will be possible.

The production of coal-tar, evaporated goods, combustibles, paints, beet sugar, glycerine, fine-quality papers, etc., has also progressed to a significant extent. There are no less than 33 factories making sulphuric acid, the output of which is sufficient to meet overseas orders. Last year 25,000,00 kin (1 kin = 1·228 lb.), valued at 1,520,000 yen (1 yen = 2s. ½d.) was exported. Nitric acid is being made from Chilian saltpetre in eight factories, but little or no use has yet been found for nitre cake. The manufacture of hydrochloric acid and of alkali is in need of greater development. The average amount of soda ash imported before the war was valued at 3 million yen per annum. In 1914, the value of this product was 1,557,479 yen imported from Great Britain, and only 63,707 yen produced at home. The total amount of manufactured chemical products is about 630,000 tons a year, and this will be increased by about 20,000 tons, when plants now in the making have been completed. The most important of the latter are the Kwanto Acid and Alkali Works, the Japan Artificial Fertiliser Manufacturing Co., and the Japan Chemical Manufacturing Co., above-mentioned.—(*The International Trade, Oct.* 15, 1917.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

The Non-Ferrous Metal Industry Bill, 1917.

Under the provisions of this measure, now before the House of Commons, it is made illegal to carry on the business of extracting, smelting, dressing, refining, or dealing by way of wholesale trade in the non-ferrous metals or their ores, unless a licence to do so has been obtained from the Board of Trade. Licences are to be renewable annually and licensees must pay a prescribed fee, furnish such information and allow inspection of such books and documents as may be reasonably required, both on application or at any subsequent time. Contraventions of the Act will be punished by imprisonment up to three months and/or a fine not exceeding £100, and for refusing information, or giving false information, a similar penalty applies, except that the maximum fine is £20. The metals and ores are specified, and the expression "ore" is taken to include concentrates, mattes, precipitates, and other intermediate products. The Act would become operative six months after the passing of the Bill and would remain in force during the continuance of the present war and for a period of five years afterwards.

In moving the Second Reading of the Bill on December 3, Sir Albert Stanley (President of the Board of Trade) explained its clauses and asserted that the vital principle of the measure was the exclusion of all non-ferrous metals required by this country from enemy influence and control. In the Schedule to the Bill an "enemy" is defined as a person who is or has been or who was at any time before August 4, 1914, the subject of a State which subsequently became an enemy State. He described the position of this country at the outbreak of war, the world-wide ramifications and machinations of the German metal companies, particularly the Metallurgische Gesellschaft of Frankfurt, referred to the work and recommendations of the Non-Ferrous Metals Committee, and announced that the principle of the Bill had been approved by the London Metal Exchange. In moving that the Bill be read this day three months, Mr. J. M. Henderson said that the Government had already acquired complete control of these metals. The measure was one of intense fear or jealousy, and it practically amounted to an economic boycott. Such a boycott is impracticable. America would never agree to it; and we must not forget that Germany was our best customer before the war, some £80,000,000 worth of trade per annum having passed between the two countries. A peace involving an economic boycott could not be a lasting one. The motion was not se onded, but subsequently the rejection was moved by Sir F. Banbury and seconded by Mr. Henderson. The member for London was in sympathy with the principle of the measure but he thought it allowed of too much Government interference, and would also prove ineffective. It is quite impossible for any manager or director of a company to know who are the real owners of shares held by nominees. After a long debate, which was continued on December 11, the Second Reading was carried by 182 votes to 79, and the proposal to commit the Bill to a Committee of the Whole House by 167 to 91.

On going into Committee on December 18, an amendment by Mr. Pringle, to limit the requirements in regard to licence to persons, etc., suspected of enemy association or influence, was negatived by 148 votes of 80. During the course of his speech in moving that the operation of the Act be suspended until six months after the war, Mr. Hemmerde asked the following question: "Is it or is it not in the contemplation of the Board of Trade that the passing of this Bill is to be followed by the creation of a British Metal Syndicate under Government patronage? Sir A. Stanley replied that the formation of such a syndicate is not contemplated, but he hoped that the Act would enable English traders to establish themselves in a sufficiently strong position to supply all the metal that is required in this country to encourage the development of the resources within the Empire, and to keep out the intrigues and the metal connected with the Metallegsellschaft of Germany. In answer to the further questions as to whether the organisation of British Industry is inconsistent with the existence of the firm of H. R. Merton and Co., and if that company had been so re-organised under his supervision that it would be quite impossible for the Metallgesellschaft or the Metall Bund to have control of it, the President replied that it was inadvisable to refer to any firm or individual in a way which might be prejudicial to their interests. He could say, however, that if the Bill became law, Merton's and any other firm would have an ample opportunity of presenting their case when they came to ask for a licence. Mr. Hemmerde's amendment was defeated by 165 votes to 68.

An amendment by Sir E. Pollock to insert the word "winning" as applied to the metals in question, was accepted on behalf of the Government. Sir A. Stanley intimated that the licensing fee would be a very nominal one; and also that he was prepared to introduce words into the Bill to make it clear that both "winning" and "extracting" would be limited to the United Kingdom. Progress was then reported.

British America Nickel Corporation (Loan).

Mr. J. Henderson asked the Chancellor of the Exchequer whether the Government, through the Minister of Munitions or other Departments, have advanced, or agreed to advance, a sum of money, about £1,500,000, to the British America Nickel Corporation, Limited, on the security of the debentures on prior lien bonds of the company; and, if so, with what object was the advance made or promised to be made.

Mr. Wardle: My right hon. Friend has asked me to reply to this question. His Majesty's Government has agreed to make a loan of 3,000,000 dollars to the British America Nickel Corporation, subject to certain conditions as to control. The object of the loan was solely con-

nected with the prosecution of the war, and it would be contrary to the public interest to give any further particulars.—(Dec. 12.)

Used tea leaves.

On December 23, Mr. Lynch asked the Financial Secretary to the War Office whether he was aware that Army cooks are ordered to dry and save used tea leaves, for which 3d. per pound is credited to the regimental funds; and, if so, for what purposes these used tea leaves are saved and who are the purchasers.

Mr. Forster: The conservation of dried used tea leaves was undertaken as an experiment for the purpose of extracting caffeine, but the process was not found practicable on a satisfactory commercial scale, and the sale of dried used tea leaves is not now authorised.—(Dec. 13.)

Cannel coal.

Captain Wright asked the President of the Board of Trade, in view of the shortage of oils and the results which have been attained by recent experiments by the Research Committee of the Ministry of Munitions in the treatment of a seam of cannel in a Midland county, whether it has been decided to proceed with the development of that seam or to continue the policy of refusing consent to any development of seams of cannel however prolific in oil, and compelling the above and any petroleum committee that may be set up by future legislation to confine their attentions to the shales of Scotland or elsewhere.

Sir W. Evans: I should be glad if my hon. Friend will tell me which is the seam of cannel coal to which he refers. It is the intention of the Government to deal with every seam of cannel coal which offers sufficient facilities for development, as soon as suitable retorts are available for the extraction of the oil.—(Dec. 13.)

Calcium carbide.

Asked if there was any prospect of calcium carbide being released for purposes of illumination, Sir Worthington Evans (Joint Parliamentary Secretary to the Ministry of Munitions) said that owing to the shortage in supply, it had been found necessary to limit its use almost entirely to manufacturers of munitions of war, and to shipbuilding. He could hold out no immediate prospect of release for ordinary purposes of illumination. In reply to supplementary questions, information was given to the effect that every possible source of supply was being utilised, and that quite considerable quantities were now being made in this country.—(Dec. 13.)

Enemy trade marks.

Sir Richard Cooper asked the President of the Board of Trade under what power the enemy trade marks, Sanatogen (246,802 and 257,583) and Formamint (264,704), were removed from the Register of Trade Marks, seeing that applications made in 1914 under the Patents, Designs, and Trade Marks (Temporary) Rules Acts, 1914, were refused; and whether, in the interests of the trading community, he will use the same power to remove from the Register of Trade Marks other enemy-owned marks which, like the two referred to, are the names of articles the patents for which have expired

Sir A. Stanley: The trade marks in question were removed from the register by the Board on grounds of public interest under the powers conferred by the last paragraph of Rule (1) of the Trade Marks (Temporary) Rules, 1914. The Order was made after careful consideration of evidence which was not available in the former applications. Any suggestions for the removal of marks of the character referred to by the hon. Member will, of course, be carefully considered, but it is desirable that applications for such removals should be made in the ordinary way under Rule (1).—(Dec. 18.)

Petroleum.

Mr. Denman asked if the Prime Minister was aware that the need for petroleum was not less urgent than it was last summer; and whether he could satisfy the desire that progress should be made with an Amended Petroleum (Production) Bill? Mr. Bonar Law, in reply, stated that he expected to be in a position to state the intentions of the Government on this subject immediately after the Recess.—(Dec. 18.)

Spirits (manufacture).

Mr. Field asked the Parliamentary Secretary to the Ministry of Food whether there are any spirits being made in Great Britain beyond what is used for munition purposes; whether more spirits are being manufactured than are required for munition purposes; whether the manufacture in Scotland is almost equal to that of the pre-war period or a greater quantity than is required for munition purposes is being manufactured; and, if so, what is intended to be done with the overplus?

Mr. Clines: The spirit now being made in the United Kingdom is used for the manufacture of munitions and for other war purposes, and also for certain essential industrial trades. The total output is insufficient to meet these requirements. The manufacture in Scotland is at present about equal to the pre-war output.—(Dec. 20.)

Palm kernels.

General Croft asked the Parliamentary Secretary to the Ministry of Food whether there are large quantities of West African palm kernels stored in this country by neutrals; if so, whether the Food Controller is now going to commandeer this produce? In reply Mr. Clynes said the Food Controller had requisitioned all palm kernels in the United Kingdom belonging either to neutrals or to British subjects.—(Dec. 20.)

LEGAL INTELLIGENCE.

THE QUALITY OF ANILINE DYES. *George Kenyon, Ltd., v. Bennett and Co.*

In the King's Bench Division on December 5, Mr. Justice Bray heard an action by G. Kenyon, Ltd., of Manchester, against Bennett and Co., of Fenchurch Street, E.C., to recover damages for alleged breach of conditions or warranty on the sale by defendants to plaintiffs of certain aniline dyes for the production direct without a mordant of bright fast pink shade, and known by the particular trade description of "direct pink." The contract was for the sale of two cwts. "direct pink" at 18s. per lb., 284 lb. "direct pink," geranine shade, at 18s. 6d. per lb., and 411 lb. "direct pink" at 28s. per lb., to be in accordance with samples. The goods were delivered to plaintiffs about September 4th, 1915, and plaintiffs paid in respect of purchase £916 8s.

Mr. Green, K.C. for plaintiffs, said that the dyes delivered did not correspond with the description "direct pink"; they were of inferior quality, and would not produce bright fast pink shades without a mordant, or at all. Plaintiffs claimed £870, the difference between the value of the dyes delivered, and the market price of the same quantity of "direct pink" aniline dyes. Mr. H. C. Taylor, of Manchester, said in evidence that the specific trade meaning of "direct pink" was a colour that dyed cotton direct without a mordant, and that was reasonably fast to organic or acetic

acids. All the dyes in dispute contained benzo-purpurine, which was not fast to acid.

Mr. R. A. Wright, K.C. for the defendants, said that his clients maintained that "direct pink" meant what it was as a description, and that the rest of the contract was covered by the sending of samples. There was no warranty of fastness and there had been no suggestion on the part of plaintiffs that the samples did not correspond with the bulk.

Mr. H. C. Taylor, in cross-examination, said that before the war 85% of the trade was in the hands of German manufacturers, and that each big German manufacturer sold according to his own description. Mr. F. Schofield, said that pink colours used in the cotton trade must be fast to acid, as the latter must be employed to give the textile a silky feel. The term "direct pink" excluded benzo-purpurine or any of its derivatives.

Mr. E. A. Swift, managing director of the Sandoz Chemical Co., agents for a well-known Swiss firm at Basle, said that "direct pink" was a term which signified a dye belonging to the series "Erica," which was fast to acetic acid.

Mr. Patrick Hastings, appearing for the defendants, said that before the war German manufacturers always sold according to their own particular descriptions which were published in their catalogues. If, after the war broke out, a guarantee of any colour was wanted, it was necessary to have it put expressly into the contract, and to have a sale by sample. The sale in question took place long after the declaration of war, and pre-war custom did not apply.

In delivering judgment on December 18, Mr. Justice Bray said that the contract in question was made in August, 1915, and was for sale by sample of certain lots of dyestuffs described in the contract documents as "direct pink." There was no question that the goods delivered were equal to sample, and by the provisions of the Sale of Goods Act, it was a sale by description. The contention of the plaintiffs was that the goods were not as the description in the contract. According to them, "trade pink" was a well-known and particular trade description of an ascertained and recognised commodity, and denoted or implied that the dyes would produce direct, bright, fast pink shades. They made two main contentions: (1) the pink supplied was not fast to acid, and (2) the dyes were not uniform and consisted of mixed dyes. As regards (2), it was quite clear that no case had been made out. No doubt it was necessary that the dyes should produce a reasonable pink, and in his opinion they did. As regards (1), it was admitted by defendants that these dyes were not fast to acid, therefore the sole question was whether there was an implied warranty. Neither the word "direct" nor the word "pink" implied fastness, but the plaintiffs maintained that the combination of the two words implied a warranty of fastness. According to the witnesses on both sides, no case had ever occurred in which this dispute had arisen. It was said that this implied warranty existed before the war and down to March or April, 1916, though it did not exist now. If a buyer wanted such a warranty now, he must get an express guarantee to that effect. In order to determine this question, it was necessary to consider the nature of the trade in dyes before the war. At that time the Germans had 85—90% of the trade in this country, and their agents here possessed the books published by the German firms, which gave full particulars of their dyes, including their fastness towards acid. Customers in this country would apply to these agents and buy the dyes under a particular name, and they were invoiced under that name. The words "direct pink" were not used by any of the German firms in any of their published books; they were, however, used by a Swiss firm which did a small trade in this country before the war, but in such a way that every one would know that the dye was obtained from that firm. It was difficult to say that there was an implication or alleged warranty. The defendant's witnesses said they had never heard of this implied warranty to "direct pink." He was satisfied that these words had no such definite trade meaning as suggested, and he so found. He believed there was a difference of opinion, the result of which was that a very few months after the sale under this contract, buyers who wanted a fast pink required an express contract. His lordship accordingly found that the goods delivered were in accordance with the contract, and that the plaintiffs' case failed. There must be judgment for the defendants with costs.

On plaintiffs' counsel asking for leave to appeal on account of the importance of the case to the Manchester dye trade, Mr. Justice Bray said: "It is of no importance at all now, because it is clear that whatever 'direct pink' may have meant in 1915, it conveys no such warranty now."

RAILWAY CHARGES FOR BENZOL, TOLUOL, ETC. *Traders' Traffic Conference (Walsall) v. Midland Railway Co.*

An important test case affecting the railway rates of benzol, naphtha, and toluol, was heard by Mr. Justice Lush, the Hon. Gathorne Hardy, and Sir Jn. Woodhouse, sitting in the Railway and Canal Commission Court, on December 11th last. Applicants sought a declaration that the tar products named were spirits of tar, and comprised within Class 2 of the statutory classification of railway charges. Mr. Whitehead, K.C., for the applicants, complained that the railway company had charged rates for these goods under Class 3: the Act of Parliament had classified spirits of tar under Class 2, and the railway companies were not justified in altering the classification for the purpose of rates. Evidence for the applicants having been given, Mr. Talbot, K.C., for the Railway Co., claimed that the latter had rated within their rights in treating these goods as they had done. Classification 2 was drawn up to exclude dangerous goods, and those in question belonged to that category. The application was refused. Mr. Justice Lush said that the Court was of the opinion that these products were not mentioned in Class 2, and that the Railway Co. was entitled to deal with them as dangerous goods, and to make a reasonable charge for them.

PRE-WAR ENEMY CONTRACT. *H. Wiggins and Co., Ltd. (Birmingham) v. G. Selve and W. Selve.*

The plaintiffs in this case, which was heard before Mr. Justice Bray on December 18th last, sought a declaration that certain agreements which they had entered into in 1913 with the defendants (who traded as Basse and Selve of Altona, and the United German Nickel Works A.-G. of Schwerte, Germany), were abrogated and avoided owing to the outbreak of war. Under the agreements the defendants contracted to assist the plaintiffs, who were nickel and cobalt refiners, in designing plant and in erecting an installation to manufacture their goods, and to send over members of their staff to supervise, for which they were to be remunerated by the plaintiffs. Mr. Justice Bray observed that he had not had a case of this kind before. The plaintiffs had had the assistance of the defendants to establish their works up to the time of the war. With regard to the profits, if he declared the agreements were at an end, plaintiffs had all the benefit and the defendants none. Mr. E. W. Asbury, secretary to the plaintiff company, said that the terms of the agreement were carried out up to the outbreak of hostilities, with the exception that no one was sent over to

supervise the installation of the plant. Since then no business had been done, and his company had been ordered by the Government to disclose to them the secret process which was to be used. His lordship granted the declaration plaintiffs asked for, but without prejudice to any claim that might be made by defendants or either of them as to remuneration, on *quantum meruit* or otherwise, for any services rendered or goods supplied by them or either of them before the outbreak of war. The application for costs was refused, as defendants did not appear.

GOVERNMENT ORDERS AND NOTICES.

SALE AND SUPPLY OF OXYGEN.

The Lords Commissioners of the Admiralty have issued an Order, dated December 17, ordering that, from and after that date and until further notice, the sale and supply of oxygen in the United Kingdom shall be regulated in accordance with such directions as may from time to time be given by the Director of Materials and Priority, Admiralty, and further that—

(1) No person or company manufacturing or supplying oxygen shall sell or supply the same otherwise than to such persons or companies and in senh quantities as the said Director of Materials and Priority shall from time to time direct; and (2) all persons and companies manufactnring or supplying oxygen, for sale or for their own use, and all persons and companies requiring to purchase oxygen, shall render such full and accurate returns as the said Director of Materials and Priority shall from time to time direct.

TIN.

The Minister of Munitions has made an Order, dated 15 December, ordering that the "war material" to which Regulation 30B of the Defence of the Realm Regulations applies shall include tin.

PRIORITY CERTIFICATES FOR EXPORT OF GOODS.

The Director of the War Trade Department has announced a new procedure in respect of Priority Certificates for all goods subject to Priority control by the Departments of the Admiralty and of the Ministry of Munitions, and intended for export to neutral or allied countries. *After January* 14, 1918, *applications* for such certificates *should be made in duplicate* on the ordinary War Trade Department application forms *to the Secretary, War Trade Department, 4, Central Buildings, London, S.W.*1. One of the two applications should be marked "Duplicate," and the two forms should be securely pinned together, one inside the other. If the War Trade Department has no objection to the export, they will communicate with the Priority Department concerned, with a view to the grant of a Priority Certificate, and, if this be granted, it will be forwarded by the War Trade Department to the applicants, who should *not* communicate with the Priority Departments direct. As soon as the goods covered by the Priority Certificate are manufactured and ready for shipment (if they are such as require an export licence), the applicants should so inform the War Trade Department, whereupon, apart from unforeseen contingencies, the necessary licence will be issued to them. If the goods do not require an export licence, the War Trade Department need not be approached, and the goods may be exported subject to Customs regulations.

In the case of exports to British Possessions, the existing procedure is not changed. In the care of exports to Allied countries of goods purchased directly by, or on behalf of, an Allied Government or required for the execution of specific Allied Government contracts, application for a pirority certificate should be made to the Commission Internationale de Ravitaillement, India House, Kingsway, London, W.C.2., who, if prepared to support the case, will arrange for the issue of a Priority Certificate.

Intending exporters are warned that care should be taken in submitting applications to state any *special reasons* which may exist, in support of their request for permission to manufacture and export goods subject to Priority Control. In the absence of such special reasons, it is improbable, under existing circumstances, that the desired facilities will be granted.

[The full text of the Order is given in the *Board of Trade Journal*, January 3, 1918.]

DEFENCE OF THE REALM REGULATIONS.

Light, heat, and power.—11A. The Minister of Munitions, with a view to maintaining or increasing the supply of light, heat or power, may, under this Regulation, direct that lights shall be extinguished, or their use restricted.

TAR (COAL AND WATER-GAS) ORDER, 1917. NAPHTHA ORDER, 1917.

TAR.

The Minister of Munitions in exercise of the powers conferred upon him by the Defence of the Realm Regulations orders as follows:—

1. For the purposes of this Order, the expression "Coal Tar" shall mean tar produced or derived from the destructive distillation of bituminous material by any means other than blast furnaces, the expression "Water Gas Tar" shall mean tar produced by carburetting water gas, and the expression "Tar" shall mean and include both coal tar and water gas tar as above defined.

2. No person shall as and from the day following the date of this Order until further notice purchase or offer to purchase any tar (whether crude or dehydrated) except under and in accordance with the terms and conditions of a licence issued by or under the authority of the Minister of Munitions. Provided that no licence shall be required:—

(A) By a tar distiller for the purchase of tar in any quantities, provided that the whole quantity purchased is intended to be, and is in fact, distilled to pitch by such distiller.

(B) By any person for the purchase of tar (whether crude or dehydrated) in quantities not exceeding ten gallons, provided that the total quantity purchased by any one person during any one calendar month does not exceed 50 gallons.

3. No person shall, as from the day following the date of this Order until further notice, except under and in accordance with the terms and conditions of a licence issued by or under the authority of the Minister of Munitions:—

(i.) Accept delivery of or make payment for any coal tar tendered for delivery under any contract existing at the date of this Order unless (A) such contract was entered into prior to the 5th September, 1917, and is in writing; and (B) full written particulars of such contract were furnished to the Minister of Munitions before the 1st October, 1917, by the person entitled at that date to deliveries thereunder; or

(ii.) Accept delivery of or make payment for any water gas tar tendered for delivery under any contract existing at the date of this Order unless (A) such contract is in writing, and (B) full written particulars of such contract shall be furnished to the Minister of Munitions before the January 25, 1918, by the person for the time being entitled to deliveries thereunder.

4. As on and from January 15, 1918, until further notice, no person manufacturing or producing tar shall burn or consume any such tar for firing, steam raising, or heating purposes, nor use any such tar for any other purpose except under and in accordance with the terms and conditions of a licence issued by or under the authority of the Minister of Munitions. Provided that no such licence shall be required by a manufacturer or producer of tar who is also a tar distiller to entitle him to distil to pitch all or any of the tar manufactured or produced by him.

5. The Order of the Minister of Munitions, dated September 4, 1917, relating to coal tar is hereby cancelled, but such cancellation shall not affect the previous operation of that Order nor the validity of any action taken thereunder, nor the liability to any penalty or punishment in respect of any contravention or failure to comply with such Order prior to this cancellation, nor any proceeding or remedy in respect of such penalty or punishment.

6. This Order may be cited as the "Tar (Coal and Water Gas) Order, 1917."

CRUDE SOLVENT NAPHTHA, SOLVENT NAPHTHA, AND HEAVY NAPHTHA.

The Minister of Munitions, in exercise of the powers conferred upon him by the Defence of the Realm Regulations, orders as follows :—

1. No person shall, as from January 10, 1918, until further notice, supply to any person, or take, or accept, or attempt to obtain delivery of any crude solvent naphtha, solvent naphtha, or heavy naphtha, except under and in accordance with the terms and conditions of a licence issued by or under the authority of the Minister of Munitions.

2. All persons engaged in producing, treating, distributing, storing, selling, or dealing in crude solvent naphtha, solvent naphtha, or heavy naphtha, or in any manufacture, trade, or business in which the same or any of them are used shall make all such returns with regard to their businesses, and verify the same in such manner (including production of their books) as may from time to time be required by or under the authority of the Minister of Munitions.

3. For all purposes of this Order the expressions "Crude Solvent Naphtha," "Solvent Naphtha," and "Heavy Naphtha," shall mean crude solvent naphtha, solvent naphtha, and heavy naphtha, obtained during distillation of coal tar or extracted from coal gas.

4. This Order may be cited as the Naphtha Order, 1917.

All applications in reference to this Order, including application for licences, should be addressed to the Director of Raw Materials Supply, Ministry of Munitions, Department of Explosives Supply, Storey's Gate, Westminster, S.W. 1.

OILS AND FATS (REQUISITION) ORDER, 1917.

By this Order, dated December 21, 1917, the Food Controller takes possession of all supplies of the following oils and fats, crude or refined, existing in the United Kingdom on January 1 :—Castor oil, coconut oil, cottonseed oil, gingelly (sesamé) oil, ground nut, hempseed oil, kapokseed oil, linseed oil, maize oil, Mowrah seed oil, Nigerseed oil, olive oil, palm oil, palm-kernel oil, poppy seed oil, rape seed oil, shea butter or oil, soya-bean oil, sunflower-seed oil, oleine distilled, stearine distilled, vegetable tallow, neutral lard, oleo oil, premier jus, imported tallow, stearine (beef and mutton). The Order also applies to all residues and by-products from refining or splitting ; and further, to all such goods which arrive or are made after January 1, 1918.

REFINED VEGETABLE OILS (REQUISITION) ORDER, 1917.

The occupier of every factory or workshop engaged in refining, bleaching, deodorising, pressing and finishing, or otherwise treating the specified vegetable oils, is required to place the whole of his production at the disposal of the Food Controller, for the manufacture of margarine and edible cooking compounds.

REPORT.

COMMITTEE ON CHEMICAL TRADE.

The Committee appointed by the Minister of Reconstruction in October, 1917, to advise him on the procedure to be adopted for dealing with the chemical trade, has now issued its report [Cd. 882, 1d.]. The terms of reference were :—

I. To advise as to the procedure which should be adopted by the Minister of Reconstruction for dealing with the Chemical Trade.

II. To consider and report upon any matters affecting the Chemical Trade which could be more effectively dealt with by the formation of special organisations for the purpose, and to make suggestions in regard to the constitution and functions of any such organisation.

1. It is evident that during the process of Reconstruction numerous difficult problems and questions are likely to arise in connection with the Chemical Trade. The Committee is of opinion that these can only be satisfactorily settled by the closest collaboration between the Minister and the representatives of the trade, and it appears to be necessary that the Minister should be in a position to obtain the views both of the trade as a whole and, in the case of particular problems, of that branch of the trade directly concerned.

This end could probably be attained in a satisfactory manner if there were in the Chemical Trade a representative body, which could advise and act in a consultative capacity on chemical matters. Such a body should be fully representative of the whole of the trade, and the difficulty lies in naming an Association which could be said completely to fulfil this condition.

An examination of the list of Members of the Association of British Chemical Manufacturers reveals the fact that, while the heavy and fine chemical trades are satisfactorily represeuted, certain branches of the industry are not at present adequately represented, *e.g.*, fertiliser manufacturers, sulphate of ammonia manufacturers, tar distillers, explosive manfuacturers, etc. Most of these trades have their own Associations, consequently the whole of their members have not seen fit to join the Association of British Chemical Manufacturers, although, of course, it is open to them to become members if they so desire, and some have already done so.*

*We understand that representatives of the branches have now joined the Association.—ED.

Membership of the Association of British Chemical Manufacturers entails the payment of a considerable subscription, but it is understood that this course has been adopted in order that the Association may not be hampered by lack of funds in carrying out the wide constructive policy outlined in its Articles of Association.

The Committee is of opinion that the Association of British Chemical Manufacturers is the most representative Association of the Chemical Trade at present in existence in this country, and that it does, generally speaking, represent the trade as a whole.

In dealing with the Chemical Trade, the Minister could properly act in collaboration with the Association of British Chemical Manufacturers. If, however, it should be necessary to take advice concerning a branch of the trade not adequately represented in this Association, the appropriate Association could be taken into consultation; and with a view to convenience of practical working, and in order to establish the permanent link which we are convinced should exist between the Ministry and the trade in all its branches, a standing Committee should be established fully representative of all the interests concerned.

II. The Committee thinks that it will be necessary to establish a Section of the Ministry of Reconstruction, which will be in a position to deal with matters which may arise in connection with the Chemical Trade, and suggests the appointment of a scientific man of good standing, who would command the respect and confidence of the trade, together with the necessary staff. This Section, working in conjunction with the Standing Committee previously mentioned, would provide an adequate organisation for dealing with questions connected with the Chemical Trade.

The following would represent some of the duties of this Section :—

1. To ascertain with the assistance of the Standing Committee the chief problems which are likely to arise in the process of reconstruction after the war, and the best means of dealing with them.

2. To survey generally the Chemical Trade, both at home and abroad, and in consultation with the Standing Committee to afford advice for the broadening and improvement of the Chemical Trade of this country.

3. To collect and disseminate information on and statistics of the Chemical Trade.

4. To collect and collate as much information as is available on the work which has been done during the present war, which would, no doubt, be of great interest and assistance to the Chemical Trade as a whole.

In suggesting an organisation on the above lines, the possible necessity of establishing *ad hoc* Committees to advise on particular problems has not been overlooked.

In the foregoing report the Committee's recommendations have been confined within the narrow limits set out by the terms of reference, which speak only of "Chemical Trade." If, however, for that expression were substituted the "National Chemical Industry," a much broader purview would be involved, and specific reference would be necessary to existing organisations other than those specifically founded for "Trade" purposes, among which may be mentioned :—

The Society of Chemical Industry.
The Government Laboratory.
The Committee of the Privy Council for Scientific and Industrial Research.
The Imperial Institute.
The National Physical Laboratory.
The Chemical Society.

SUMMARY OF RECOMMENDATIONS.

1. That in dealing with the problems of the Chemical Trade, action should be taken as far as possible in the closest collaboration with representatives of the trade.

2. That the Association of British Chemical Manufacturers should be considered as representative of the Chemical Trade as a whole with certain branches excepted.

3. That a Standing Committee should be appointed. This Committee, which should be fully representative of all the interests concerned, would establish a permanent link between the Ministry and the trade.

4. That a Departmental Organisation should be set up in the Ministry of Reconstruction to deal with chemical questions.

The report is signed by :—Sir K. W. Price, Mr. John Anderson, Mr. J. F. L. Brunner, Dr. Chas. Carpenter, Prof. J. G. Lawn, Sir Wm. Pearce, Mr. K. B. Quinan, the Rt. Hon. J. W. Wilson, and Mr. G. C. Smallwood (Secretary).

1st November, 1917.

TRADE NOTES.

BRITISH.

The British Industries Fair, 1918, will be held at the Pennington Street premises of the London Dock (near the Tower Bridge) from March 11 to March 22 inclusive. As on the last occasion, the Fair will be restricted to the following trades: Earthenware and china, glass, fancy goods, paper stationery and printing, toys and games. The number of exhibitors will not exceed 400—500. Invitations to the Fair will be issued by the Board of Trade, and admission will be restricted to *bona fide* buyers in the trades concerned.

British Industries Fair (Glasgow), 1918.—This Fair, which is being organised by the Corporation of the City of Glasgow under the auspices and with the support of the Board of Trade, will be held in Glasgow, simultaneously with the British Industries Fair organised by the Board of Trade in London, namely, from March 11—22, and will include the following trades, viz.: Chemicals (light and heavy), Domestic Chemical Products, Foodstuffs (prepared and preserved). Any manufacturers wishing to exhibit should apply for further particulars to the General Manager, Mr. James Freer, 38, Bath Street, Glasgow.—(*Bd. of Trade J., Dec.* 13, 1917.)

Australian Copper Producers' Association.—The Federal Government has formed a Copper Producers' Association, on the same lines as the Zinc Producers' Association, to control the shipping, selling, and outputs of Australian copper, the annual production of which is estimated to be worth £5,000,000.

Calcium carbide in Australia.—As late as in 1913 the Australian Commonwealth imported 15,000 tons of calcium carbide, and previous to this the article had been imported for many years into the country. The calcium carbide industry is now being developed in Australia, where the article finds a great field for various purposes, such as lighting, in metal work, such as the welding of iron and steel, as well as for agricultural purposes, such as spraying of fruit trees, etc.—(*Kelly's Monthly Trade Review, Dec.* 1917.)

The supply of carbide.—At a well-attended, extraordinary meeting of the British Acetylene and Welding Association, held on December 4

last, the following resolution was carried unanimously :—

> "That the Association approach the Ministry of Munitions with the object of requesting them to arrange with the British Carbide Factories that the latter shall only sell their carbide through the recognised carbide distributors, and that the sub-committee be empowered to continue the necessary negotiations with the Ministry, and also that the sub-committee be instructed to take all possible steps to induce the Ministry to fix remunerative re-selling prices."

Indian Products and Adulteration.—The prevalence of the practice of adulterating Indian produce before export has once more been engaging the attention of the Indian Government. The question is an old one, and though the purity of a few Indian products—and most notably wheat—receives nowadays adequate attention, the Indian Government do not think such an assertion can be made generally. It is common knowledge that cotton and jute are still watered, while ground nuts, hides, indigo, hemp, beeswax, and oils are found adulterated. The Government of India do not favour meeting the evil by legislation, which they think would be difficult to carry out and also ineffective. They point out that the buyers of Indian produce ought to be able to effect an improvement by combining to decline adulterated goods. A more practical suggestion, in the opinion of the British Empire Producers' Organisation, is that Trade Associations in India should institute some system of certifying to the purity of Indian products before export. An educational and publicity campaign directed to pointing out the short-sightedness of the adulteration habit, might also be worth considering.—(*Production, No.* 15, 1917.)

FOREIGN.

International Exhibition, Amsterdam.—According to the Chemiker-Zeitung, the recently-formed "Het International Handelspaleis te Amsterdam" has arranged a permanent exhibition to be opened about two months after the conclusion of peace. The address of the International Trade Palace is Post Box 360, Amsterdam.

The next Lyons Fair.—Preparations are already being made for holding the next Lyons Fair, and it is likely in the near future to become a formidable rival to the one which has been held at Leipzig for so many years. In the first year in which the Fair was held, the business was valued at £2,280,000, and this amount was more than trebled in 1916, exclusive of sales valued at £8,400,000 done with the United States by means of catalogues, etc. British participation, however, has not been very large. Most French merchants and importers are, of course, fully aware that it is virtually impossible for British firms of many lines of goods to undertake extensive deliveries during the war, and by far the larg e majority of inquiries for manufactured articles from firms in France who are anxious to cement relations with English makers are in anticipation of post-war business.—(*Brit. Expt. Gaz., Nov.* 1917.)

Sicilian sulphur.—The exports of sulphur are decreasing daily, and some apprehension is felt in regard to the future of the Sicilian sulphur trade.

Aluminium sulphate in Norway.—It is reported that as a result of very successful experiments in producing aluminium sulphate from Labradorite, it may now be anticipated that Norway's demand for aluminium sulphate for the paper industry in the future may be filled in this manner, and two factories are already being planned on the West Coast of Norway.

Copper sulphate in Algiers.—The market demand for sulphate of copper is steady, but prices are far from steady, having risen from 250 francs per metric ton before the war to 2000 francs for the time being. The wine culture of the country is increasing yearly, and will no doubt absorb very large quantities of sulphate in years to come.

Dye manufacture in America.—An undertaking has been formed in Boston to manufacture tanning extracts and dye for colouring khaki cloth from bois-d'arc (orange). American dye manufacturers have made very great efforts to meet the shortage which became quite acute soon after the commencement of the war, as the United States annual consumption had a value of no less than £3,093,750 of which only £618,750 were actually made in the country, whereas the rest was imported from Germany. The American dye manufacturers will be able to meet the total demand for dyes during 1918. The present *ad valorem* tax on dyes amounts to 30%, with a specific tax of 5 cents per lb., which will continue during the next five years, when a new tax ot only 4% will come in force.

Cement manufacture in Bermuda.—"We understand that some American cement experts have examined the Bermudan limestone deposits, with a view of erecting a cement factory on the outskirts of Hamilton."

Cement demand in Brazil.—Dealers in building material complain at the impossibility of obtaining cement, and, as far as is known, there are only one or two cement factories in the whole country. Cement figures on the import list of Brazil in increasingly large figures.—(*Kelly's Monthly Trade Rev., Dec.* 1917.)

New foreign companies. Spain.—A large syndicate has been formed in Bilbao with a view to establishing a first-class ironworks in Sagonte. The undertaking has adopted the name of Compagnie Siderurgique de la Mediterrannee ; capital 100 million pesetas. The new ironworks are capable of turning out 300,000 tons of iron and steel in forms required for the Spanish market. For the present the production will only be 100,000 tons, and this will be increased in accordance with the demand.

Italy.—The firm Lavelli, of Milan, has amalgamated with Alti Forni, Fonderiaed Acciaierie, of Terni, and formed the Societa Lavelli Prodotti Magnesiaci e Refrattari, with a capital of 3½ million lire for the manufacture and sale of magnesium ores and allied products. A company has been formed in Rome under the title of "Societa per los viluppo della Cianamide e dialtri prodotti chimici" (Cyanamide and other chemical products development company), with a capital of 12½ million lire, for the production of calcium nitride and also products hitherto obtained from Germany. The share capital of the "Societa Prodotti chimici Colla e Concimi," of Rome, has been increased from 9 to 12 million lire. For the purpose of acquiring and working the sulphur mines in Sicily, the "Societa Solfifera Siciliana" has been formed in Milan with a capital of 8 million lire.

Bulgaria.—The firm "Radium" has erected a works in Sofia for the manufacture of chemical products.

Sweden.—The Svenska Superphosphatfabrik A.-G., of Stockholm, has increased its capital from 3 million to 6 million kroners.—(*Z. angew. Chem., October* 5, 1917.)

The Italian chemical trade.—Imports of certain chemicals into Italy, for three months ending March 31, 1917 :—

Name.	Quantity (tons).	Country of origin.
Bleaching powder	218	Great Britain.
Borax	120	—
Carbolic acid	—	Great Britain.
Caustic soda	2113	United States.
,, ,, ...	1211	Great Britain.
Glycerine	148	France.
,, ...	65	Great Britain.
,, ...	315	Other countries.
Blue vitriol	123	United States.
,, ,, ...	25	Great Britain.
Carbonate of soda	2101	France.
,, ,, ,, ...	1388	United States.
,, ,, ,, ...	2806	Great Britain.
Acetic acid	21	Great Britain.

Large quantities of acetic acid are produced in Turin by wood distillation, some of it being exported. The demand for bichromates is practically met by home manufacture at Genoa. Borax or sodium borate is chiefly manufactured at Florence. Caustic soda of 76—78 grade is largely used by the soap factories of Milan, and also, of course, by the Government for munitions purpose. Chlorate of potash is manufactured at Legnano, and is at present under Government control. Large quantities of citric acid are produced, chiefly at Palermo, the exports during the first quarter of 1917 amounting to 362 tons. This is also under Government control for munitions purposes. Caustic soda is used instead of soda ash, owing to the prohibitive freights on the latter. Solvay carbonate of soda is in great demand, and 1000-ton contracts could probably be closed at once. Offers are also wanted for potassium bromide and senega roots. —(*U.S. Consular Report.*)

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal.*)

OPENINGS FOR BRITISH TRADE.

Applications have been received recently at the Board of Trade for :—

Pitch coke ; machinery and appliances for the manufacture of sugar of milk : and machinery for treating and dyeing furs.

Glue.—A Canadian Company wishes to purchase supplies of glue suitable for the manufactnre of chairs, and invites samples and quotations from actual United Kingdom manufacturers. (D.C.I. 37, 667.)

Chemists' supplies (French Morocco).—There an opening in Casablanca for chemists' supplies. Climatic and other special conditions naturally exercise a considerable influence in determining the kind of drugs for which there is a demand.

Aniline dyes (French Morocco).—Native vegetable dyes are being rapidly replaced by the European aniline dyes, the growing market for which deserves careful attention. Aniline dyes are extensively employed in French Morocco for dyeing woollen and cotton yarns for carpets, rugs, etc.

Tanning materials (French Morocco).—A demand for tanning materials has been created in Casablanca by the establishment of a tannery at Rabat.

Fertilisers (French Morocco).—Few farmers have as yet experimented with fertilisers, business in which requires gradual development.

Disinfectants (French Morocco).—There is a moderate business done in the cheaper kinds of disinfectants, such as chloride of lime, etc. [All the above, D.C.I. 59,204.]

Paints, oils, etc. (French Morocco).—There is a good opening for these commodities, particularly for soap, lubricating oils and greases.

Oils, dyes, etc. (Egypt).—A firm in Alexandria with branch at Khartoum desires to get into communication with firms supplying lubricating oils and greases, linoleum and wax cloth, aniline dyes and indigo colours.

Scent for soaps, etc. (Japan).—An old-established firm at Kyoto wishes to receive samples, catalogues and quotations from United Kingdom manufacturers. A line in which the firm is particularly interested is perfume for soap, and twelve samples, with prices, are required. (Ref. No. 3.)

Portuguese West Africa. Landana is an important commercial centre of Angola, the principal industry being the extraction of palm oil from kernels which are abundantly supplied by the natives for barter or cash. The principal imports into Landana include lime, tar, and cement.

TARIFF CUSTOMS AND EXCISE.

Federated Malay States.—The import duty on petroleum is 5 cents per gallon.

Portugal.—An export surtax of 50 % *ad val.* is levied on superphosphates.

New Zealand.—The following materials, to be used solely for the manufacture of articles within the Dominions, are imported duty free :—Cobalt concentrated extract, lead linoleate, manganese linoleate.

Italy.—The following importations are allowed only under licence by the Ministry of Finance :—Chocolates and sweets (confectionery) vanilla, perfumery and perfumed soaps. In order to obtain, such a permit, the Italian import firms must, through the medium of the Chamber of Commerce of their district, present applications to the Director-General of Customs at the Ministry of Finance (Rome).

Australia.—The Board of Trade has received copy of a Notification dated December 10, 1917, containing the approved form of declaration relative to home consumption value, which must be affixed to invoices for goods exported to Australia.

Nigeria.—The "Adulteration of Produce Ordinance, 1917" (November 8, 1917), prohibits the adulteration of produce and the export from Nigeria of unclean or inferior produce. The following enactments are repealed :—The Adulteration of Produce Ordinance, the Sale of Palm Kernels Ordinance, the Adulteration of Produce Amendment Ordinance, 1907, and the Adulteration of Rubber Proclamation.

France.—A Presidential Decree, dated December 17, 1917, prohibits as from December 10, the exportation and re-exportation of hydraulic lime and sodium fluoride from France. A French Ministerial Decree of December 19 abrogates the provision of the Decree of February 21, 1915, by which phosphate of lime was allowed to be exported from France, without special authorisation, when destined for the United Kingdom, the British Dominions, Colonies and Protectorates, and certain other countries.

Norway.—The exportation of mica, metallic sodium, waste paper and cardboard has been prohibited.

Netherlands.—Under a Dutch Royal Decree (November 29, 1917), exemption from Excise duty has been accorded in respect of salt required in factories for the manufacture of briquettes intended to be used as fuel.

Board of Trade Journal.—With the issue of January 3 began a new and enlarged series of this publication. The scope is being extended, and the collection and dissemination of commercial intelligence is to be improved. Such intelligence will be distributed by means of (1) the Journal, (2) "Form K," and (3) Confidential information to firms placed on the "special register," for which the fee is two guineas per annum (journal included). Firms are invited to send particulars of the nature of information they require.

COMPANY NEWS.

LEVINSTEIN, LTD.

The annual meeting of shareholders was held at Blackley, Manchester, on December 18, when the chairman, Sir John Lonsdale, reviewed the work of the company and spoke upon the future of the dyeing industry.

Since the outbreak of war, very large quantities of dyes have been supplied by the company to the Home and Allied Governments, and the entire work has been done without Government support. By March, 1915, sufficient plant was installed to meet the entire demands of the textile mills of the world for naval and military purposes, exclusive of the Central Empires. The Blackley works are now practically self-contained, oleum, nitric acid, and intermediates all being made on the spot. Special antiseptics for the use of the troops have also been manufactured and supplied free of cost. In the manufacture of synthetic indigo at Ellesmere Port, they had had the services of the previous German manager who was well qualfied for making both the dye and the intermediate products. Prior to 1914, the German firm had merely carried out the last stage of the manufacture in these works in order to comply with the Patent Act of 1907. The difficulties connected with the manufacture of the intermediates were very great, but they were surmounted in a very short time. The company's balance-sheets for 1915 and 1916 will not be available until a settlement regarding the excess profits duty has been effected, but the dividend policy of the Board is based on conservative principles.

At the present time the greater part of the textile industries is engaged on the production of military fabrics requiring large amounts of a comparatively small number of dyes. In peacetime the requirements are very much more varied, and to meet them it is essential that preparations should be made forthwith. So far, no organised effort of a national character has been put forth. Without State assistance no private firm can, under war conditions, carry out the work that is required. Unless we are independent of Germany for our requirements when the peace conference draws near, that country will be possessed of a powerful economic weapon, for no policy of Free Trade or Tariff Reform will provide our manufacturers and users with dyes if the plant does not exist and the materials cannot be produced in this country in sufficient quantities to meet the demands as they arise.

SULPHIDE CORPORATION.

At the 21st annual ordinary general meeting of this company, held on December 24, the Rt. Hon. the Earl of Kintore (chairman), said that the past year had been full of anxieties owing to the difficulty experienced in shipping the products, labour unrest, and greatly increased costs. Fortunately, the Ministry of Munitions had now purchased their whole output of pig-lead up to October, 1918, and probably longer, and this would relieve them of the ever-growing difficulty of finding freight; but it was very doubtful if any further considerable shipments of zinc concentrates could be made except to Japan in Japanese bottoms. They had sent 6000 tons of these concentrates to their works at Seaton Carew and a further 36,200 tons had been disposed of through the Zinc Producers' Association, the formation of which body was directly due to the initiative of Mr. Hughes, the Australian Prime Minister. The total production of zinc concentrates was 55,090 tons, and of lead concentrates 87,621 tons (against 106,256 tons in 1915–16). Lead and silver prices had again ruled higher, but the average price of zinc had declined from £81¾ in 1915—16 to £51¾ in the past year. The working profit had declined from £810,418 to £636,181, and the net profit from £394,405 to £286,315, and the dividends paid from 30 to 25 per cent., but products on hand and stores stood at £152,237 higher. Practically no new development had been carried out in the past year and the ore reserves had been reduced to 1,692,000 tons, which represents about 10 years' supply at the current rate of exhaustion. The percentage recovery of lead and silver from the lead concentrates was the highest yet attained; the zinc recovered from these concentrates has at present no value, and the silver and lead from the zinc concentrates only a very small one. The amount of spelter produced at the Seaton Carew works, which the company had taken over from the Central Zinc Co., was the highest yet obtained, and during the past year they had purchased the sulphuric acid works constructed by that company for £52,000. These works utilised the sulphurous gases coming from the zinc-roasting furnaces. At Cockle Creek the extension of the acid and superphosphate plants was nearing completion. Owing principally to the coal strike, which interfered with the supply of pyrites, the output of acid fell from 10,000 to 8,600 tons, and the superphosphate production from 15,900 to 14,000 tons. In the future the Cockle Creek works should become an important centre of chemical industry in Australia. The experimental plant for the production of electrolytic zinc has given encouraging results, and all difficulties in the treatment of oxide from the blast furnace slag have been successfully overcome. They hoped in a short time to be in a position to deal with the question of the recovery of zinc from their 400,000 tons of accumulated slags. The small copper leaching plant had been very successful.

TRINIDAD CENTRAL OILFIELDS.

In the course of his address at the first annual meeting of this company on December 28, the Chairman, Mr. A. Duckham, said that the oil found in the Tabaquite area of the island was unique and certainly equal to any in the world. Actual working figures obtained in the refinery over many months' working, showed that a yield of 43 gallons of spirit was produced from every 100 gallons of crude oil. With a more up-to-date plant, no doubt 45 gallons would be obtainable. The average percentage of spirit found in the oils of the world was 8. Most of the producing wells in this area do not extend below 500 ft., and the oil is remarkably free from sulphur.

Iron and Manganese Exports from Spain.—During the first six months of 1917 there were exported 2,588,710 metric tons of iron ore, 8527 tons of manganese ore, and 1,014,636 tons of pyrites. In the corresponding period of 1916 the respective figures were 2,386,439, 2310 and over 1,500,000.—(*Iron Age.*)

Production of coal, etc.—The total mineral output of the United Kingdom in 1916 was 304,135,000—some 3,000,000 tons less than in 1915. Of this quantity, coal represented 256,348,000 tons—an increase of nearly 3,000,000 tons over the previous year. The number of persons employed in the 2847 coal mines was 998,063. The output of tungsten ores was 388 tons, or 61 tons above the 1915 production.

BOOK REVIEWS.

TECHNICAL HANDBOOK OF OILS, FATS AND WAXES. *By* PERCIVAL J. FRYER *and* FRANK E. WESTON, B.Sc. *Vol. I. Chemical and General.* 279 *pages,* 33 *illustrations, and* 36 *plates.* (*Cambridge University Press,* 1917). *Price* 9s. *net.*

The authors' object in writing this book has been to bring together in a compact volume of moderate size the main facts relating to the chemistry and technology of oils, fats and waxes of animal and vegetable as well as of mineral origin, and they have succeeded in producing a volume suitable not only as a class book for students, but also a very useful book of reference for the technical worker and the works chemist.

The first two sections are mainly devoted to theory, and contain a clearly-written account of the chemistry of the oils, fats and waxes, and of the saponification products of such as are saponifiable. In the next section, analytical data and their interpretation are dealt with, methods of analysis being postponed to form the subject matter of a later volume. A novel treatment of the subject of this section consists in the grouping of the principal oils, etc., in diagrammatic tables printed in colours, showing at a glance their "values" in relation to each other and the range of variation in the case of each individual oil; another useful feature is the technical notes explaining the significance of the several values in relation not only to the analytical testing of the product, but also to manufacturing operations. These notes are not limited to matters directly concerning the oils themselves, but refer also to solvents and solutions used in extraction and refining, adding to the general usefulness of the book in works' practice. In regard to the oils, some of the ranges of value given seem unduly wide, *e.g.*, in the case of rape oil they include ravison oil, which should, in the reviewer's opinion, be classed separately from rape, owing to its inferior qualities as a lubricant.

In Section 4, the principal oils, fats and waxes are treated individually in the following classes :—

(A) *Glycerides,* comprising the following groups : (1) Marine oils ; (2) vegetable drying oils ; (3) vegetable semi-drying oils ; (4) vegetable non-drying oils ; (5) animal oils ; (6) vegetable fats ; (7) animal fats.

(B) *Non-glycerides,* comprising : (8) The liquid waxes (sperm oils) ; (9) the solid vegetable and animal waxes ; (10) bitumen waxes ; (11) mineral oils ; and (12) mineral waxes.

The marine oils are divided into fish oils, liver oils and blubber oils. The vegetable non-drying oils are divided into the rape oil, olive oil, and castor oil groups ; the vegetable fats into those of saponification value below 200 (cacao butter), 200—225 (palm oil), and above 225 (cocoanut oil) ; and the animal fats, similarly, into those of saponification value below 200 (tallow), and those above 200 (butter fat). The members of each group are first dealt with as a class, their leading characteristics—physical, chemical and technical—being pointed out, and then individually, the most important member being taken as typical and described first. The information given about each individual oil, fat, or wax, is similarly arranged under (1) *General and analytical,* comprising chemical and physical data, chemical composition and adulterants ; and (2) *Technical,* comprising the sources, industry, refinement, properties and uses of the product. This information is concisely given under paragraphs headed with heavy type, occupying no more than one of two pages. Under physical and chemical data, the average values, normal variations and extreme limits are given, the authorities being quoted as far as possible in regard to the latter. It is obvious that a volume of this kind cannot, nor do the authors claim that it should, take the place of the standard treatises. Nevertheless, the authors have succeeded in condensing a remarkable amount of accurate and useful information into a small space, and by the skilful use of type and very clear printing, the publishers have helped them to make this information quickly available, a matter of great importance in these days of stress.

The concluding section of the book describes the production and refinement of oils, fats and waxes, and contains a very clear account of the methods used, a chapter being devoted to hardened fats.

I think the authors may be congratulated upon having produced a very useful book, one which should be used in conjunction with the standard treatises on the subject, and which those who possess the standard works will find it quite worth their while to purchase. Whilst congratulating the authors on the general scientific treatment of the subject and the care with which the text has been revised, I would suggest to them that butyro-refractometer "degrees" are not refractive indices. On page 37, line 5, "rises" would be better than "increases." On page 99, under "*Chemical composition,*" is the blank intentional ? On page 114, the "extremes recorded" under bromine thermal test evidently refer to the Maumené test.

L. ARCHBUTT.

CHEMICAL ENGINEERING CATALOGUE. (*Second*) 1917 *Edition, published annually by the Chemical Catalog Company,* 1, *Madison Avenue, New York, under the supervision of a Committee appointed by the American Institute of Chemical Engineers, the American Chemical Society, and the Society of Chemical Industry.* (12 × 8 *in.*)

This publication is replete with information concerning chemical engineering, equipment, machinery, heavy and light chemicals, dyestuffs, alloys, ores, oils and raw materials for manufacturing industries ; and in many cases data such as dimensions, capacities, and approximate costs are given. It is divided into three parts : An alphabetical list of firms (4 pages) ; an index classified according to subjects (154 pages) ; and a collection of illustrated catalogues of a large number of firms (350 pages). The index is very comprehensive. Taking trial headings at random, we find that under "Filters and Filtering" there are 55 sub-headings, and under "Furnaces," 42 sub-headings. The cross-indexing is also very full. The catalogue has a circulation of 8500 copies, and is "lent without charge for a period of one year to any chemical engineer, research chemist, industrial plant superintendent, works manager, buyer, firm, or individual who has legitimate use for such a reference work. On the issue of a new catalogue, the old one will be recalled, and the new one substituted in its place." In connection with the book, the publishers have started a Free Information Bureau, which is maintained especially for the convenience of those desiring catalogue data of an inaccessible nature, and also to deal with any important omissions from the catalogue. This bureau is in charge of a chemical engineer, who has access to the immense amount of carefully-indexed data accumulated in the course of preparing the catalogue. The book is a most useful work of reference for chemical engineers, buyers, and others, and a British publication of this character would be a valuable asset to the chemical industry of this country.

B. G. MCLELLAN.

AUTOGENOUS WELDING. *A Practical Manual by* R. GRANJON *and* P. ROSEMBERG: *Translated by* D. RICHARDSON. *5th Edition.* 244 pp. *(Charles Griffin and Co., Ltd.,* 1917.) *Price 5/- net.*

To many chemists it must be a matter for surprise that a subject such as the autogenous welding of metals should merit separate treatment in a volume of the size of the book under review. They will probably not be aware of the importance to which this branch of the metal workers' craft has attained in recent years, or of the wide field which has been opened to it. According to a recent statement, the consumption of oxygen in Great Britain alone has risen from about 30,000 cubic feet per day in 1907, to 1,000,000 cubic feet per day at the present moment, and of this stupendous amount it is estimated that at least 80 % is consumed in the autogenous welding of metals and in the allied industry of metal cutting by means of the oxy-acetylene flame. To some extent, the present volume is misnamed, because the authors are frank partisans of one form of welding, namely, by the aid of the oxy-acetylene flame. In consequence, they pay but scant attention to other systems, which should be covered by the title, such as welding with other blow-pipe flames, Thermit welding, electric welding, etc. In this attitude they are partly justified by the relative importance of the various methods in use, but their case for oxy-acetylene does not need, and is not strengthened by, such misstatements as that "welding by oxy-coal gas has not, nor can it have, serious application" (p. 15). It is a pity that the authors have not devoted more attention to some of the recent developments of electric welding which appear to bear promise of much progress in the near future.

Regarded as an introduction to the art of oxy-acetylene welding, this book is of very considerable value. The expert welder in any one metal is not likely to find much to help him in his particular branch: nor is this to be expected of a treatise on a subject in which practice counts for so much and theory for so little. The book will be most valuable for those who are unfamiliar with the subject, but who are contemplating themselves taking up welding or of installing a welding department. The chapters on the manipulation of cylinders, valves and fittings should be of value to the former, whilst those dealing with the selection of a suitable generator, the possibilities of oxy-acetylene welding, etc., will appeal to the latter. The authors deal in considerable detail with the use of dissolved acetylene in preference to the low pressure gas prepared direct from carbide, and rightly accord it the palm, except in the matter of expense. It seems doubtful to the reviewer whether the dissolved gas falls far behind, even in this respect, when the saving of time, obviation of waste, etc., are borne in mind. The book contains excellent instructions on the management of various acetylene generators and useful descriptions of burners, but the advice given as to the selection of a suitable blow-pipe lacks definiteness.

An excellent feature of the book, and one which should make it of value to the many who have recently taken up welding without previous experience of metal-working, is the description given of the physical and chemical properties of each metal in so far as they are of importance to the welder. Many useful hints are provided by the chapters on the correct preparation of joints for welding, on the importance of which the authors rightly insist.

Separate chapters deal with the welding of Iron, Steels, Cast Iron, Copper, Brass and Bronzes, Aluminium and sundry metals and alloys. That on Cast Iron is particularly good, a very detailed account being given of the difficulties to be expected and the methods of overcoming them.

A somewhat vague account of welding-machines is followed by a detailed chapter on Metal Cutting.

The general style of the book is that customary in French treatises on technical subjects, and suffers in the earlier part from some padding and consequent lack of clarity. The translation is adequate, but it is unfortunate that the translator should have followed the original with undue assiduity.

R. SELIGMAN.

PUBLICATIONS RECEIVED.

THE DISTILLATION OF RESINS. *By* V. SCHWEIZER. *Second Edition, revised and re-written, by* H. B. STOCKS. *Pp.* 212. *(London: Scott, Greenwood and Son).*

OILS FATS AND WAXES. *By* P. J. FRYER *and* F. E. WESTON. *Vol. I. Chemical and General. Pp.* 279. *Cambridge Technical Series. (Cambridge University Press.)*

AUTOGENOUS WELDING. *By* R. GRANJON *and* P. ROSEMBERG. *Fifth Edition, translated by* D. RICHARDSON. *Pp.* 244. *(London: C. Griffin and Co).*

CHEMISTRY IN THE SERVICE OF MAN. *By* ALEX. FINDLAY *Second Edition. Pp.* 272. *(London: G. Murray.)*

ARTIFICIAL DYESTUFFS. *By* A. R. J. RAMSEY *and* H. C. WESTON. *Pp.* 202. *(London: G. Routledge and Sons.)*

THE ANALYSIS OF DYESTUFFS. *By* A. G. GREEN. *Second Edition. Pp.* 144. *(London: C. Griffin and Co.)*

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Members of the Society of Chemical Industry, and others, are invited to send original articles for insertion in the Review. They should be clearly written (preferably typewritten) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised. Letters intended for the Correspondence Column must contain the name and address of the sender, but not necessarily for publication.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

STATE-AIDED RESEARCH AND THE SMALL MANUFACTURER.

In the Second Report of the Committee for Scientific and Industrial Research there is abundance of evidence that much progress has been made in preparing "one of the roads for the coming advance." The faith of the Committee in "pure" research is again emphasised, but the organisation of industrial research is considered of greater importance at the present time in view of the circumstances that the interest of manufacturers needs stimulating, and that it is necessary to take advantage of the prevailing "atmosphere," which is so conducive to the growth of new ideas.

Although adequate provision has been made for the prosecution of investigations of pressing national concern, such as those on fuel, timber and concrete, the spade-work of the past year has been largely concentrated on the organisation of co-operative industrial research, for which purpose there has been established a fund of £1,000,000 to be expended over a period of five or six years as grants in aid to Research Associations, the maximum grant to any one association not to exceed the total of the contributions of its constituent firms.

In addition to the two classes of research abovementioned, the national and the co-operative, there is a third class which covers the work of individuals and of independent manufacturers; and it is in respect of the last-named that criticisms and complaints have begun to appear. No definite or satisfactory scheme, it is said, has been devised for helping the small, independent manufacturer by means of monetary grants, or by relief from taxation; and in many cases, the incidence of the excess profits tax has fallen upon him with such severity that research work has had to be postponed or abandoned. The larger firms which have joined a Research Association have been allowed their contributions to it as a working expense for the purposes of income tax, excess profits, and war profits taxes: why should not the same privilege be allowed the manufacturer who prefers to "gang his ain gait," or is compelled thereto, owing to lack of facilities for co-operation? Surely the State does not wish to cripple the independence or initiative of the individual manufacturers to which British industry has owed so much in the past?

Before proceeding to discuss these claims, it would be well to consider first what the Committee has to say upon the subject. On the general question of co-operative *versus* individual action, the Report is very definite. "It is intended that the Research Associations should include as many of the firms in each industry as possible" (p. 12). Notwithstanding the fact that under the heading "Researches unsuited for Co-operative Action" only far-reaching problems of national importance are specified (p. 15), we read on the next page that there is room for private research by individual firms on the lines of their own special work, and they may gather many suggestions for this from the results of the co-operative investigations. No attempt is made to distinguish between work best fitted to be performed inside the works, and that to be done outside—a subject of no small importance. Research by the individual firm is further referred to as being undertaken "at its own expense."

Reference to the position of firms which do not participate in the new scheme of co-operative research is to be found in two paragraphs at the end of the Report (pp. 44 and 45). The Co-operative Associations are expected to be very useful to their constituent firms in helping them to solve difficulties encountered in the course of manufacture, "but it will take time for all the many industries of the country to organise themselves, and meantime, we shall do our best to assist inquirers to obtain the best advice available." In those cases where the problem has a *prima facie* connection with research, the Royal Society will assist the Committee in selecting an institution, or research workers, to carry out the investigation. In suitable cases, the Committee will formulate the problem to be investigated, and will pay for the services of an assistant if required. If the work proves successful, the manufacturer will be asked to pay for either the whole or a part of the expenses incurred, and in return he will have the exclusive benefits of the research "for a period to be agreed upon." An alternative method of assistance is also foreshadowed. A "young" research worker may be attached to the works laboratory for a definite period, during the first term of which the Department would pay the whole of his salary, during the second period it would pay a moiety, and during the third and last the manufacturer would bear the whole expense.

There is thus, apparently, no intention of assisting the unattached manufacturer by means of grants in aid, nor of helping him by allowing the costs of research to be paid for out of excess profits; but the general tenour of the Report, and the brevity of the allusions to this part of the subject, lead to the inference that the question is still under consideration, and that the Committee is open to revise any of the tentative conclusions it has arrived at.

Although no kind of combination between manufacturers other than that for the purpose of research is mentioned or implied, the small manufacturer who looks with repugnance upon the development of cartels, trusts, and other forms of combination, will probably see in this advocacy of co-operative research merely the thin end of a wedge which, if driven further, would lead to his ultimate extinction as an independent unit. He might further argue that the facilities for co-operation in research possessed by the larger firms, such as those engaged in the "heavy" chemical industry where fusions and "understandings" have been multiplying of late, are undoubtedly greater than those which are at present available to him, and that, pending the solution of the very difficult problem of organising the small manufacturers, he should at least receive an equal measure of State recognition. The carrying out of his researches at an institution, probably remote from his works and over which he would have but little control, or the attachment to his laboratory of a research worker, who, being specified as "young," would probably lack experience, would not satisfactorily meet his needs; and even if he were permitted to allocate the costs of research to working expenses for the purposes of taxation, he would still be at a disadvantage compared with his "combined" rival, inasmuch as he would not have at his disposal the well-equipped organisation of a co-operative association. To the unattached manufacturer, who has either been unable to initiate research work, or has been forced to abandon it from pecuniary considerations, the retort might be made that if he had invested in research before the War the cost of it could now be included in his working expenses, and that his present dilemma is but a consequence of his previous neglect or want of foresight; such

an argument, however, would come badly from a State Department, whose primary object is to encourage research, here and now. Nor does the contention that the revenue must be protected appear to carry any great weight, for much of the research work in question would have some national importance, and judged with reference to current expenditure, the sum involved would be very small.

In answer to the objection that if chemical manufacturers were assisted in the manner described a multitude of other manufacturers and traders would present similar demands, the reply could be made that each application should be considered on its merits, the main criterion being that the work for which aid was sought should be of distinct national importance. Assuming now that the principle of direct financial assistance were ceded, it would yet remain to devise a workable scheme of applying it. The Report seems to suggest that the small manufacturers should join existing associations, but it is obvious that in many cases this would not be possible, and it would therefore be necessary to form new associations. The organisation of these would be a formidable task, as the manufacturers themselves would be too fully occupied to devote the necessary time to it, and the selection of properly qualified State officials would be no less difficult, even if the officials as such were acceptable to the manufacturers. An alternative plan would be to allow a certain percentage of the excess profits to be expended upon research, the magnitude of which would vary inversely with the pre-war standard of profits, the maximum percentage being allowed to such firms which had no pre-war standard at all. A third method would be to make direct grants in aid, to vary in amount according to the needs of the individual firms. Such a proposal would involve a large amount of investigation work on the part of the Department, and it is doubtful if the manufacturer would be willing to submit to such an ordeal.

The second plan seems least open to objection, but the whole question is beset with difficulties and needs very careful consideration. From a cursory survey of the arguments for and against, we incline to the view that the small independent manufacturer has a good case for greater assistance than that promised or adumbrated in the Report; at the same time, the underlying principle of the Committee's proposals—co-operation for the common weal—admits of no refutation.

COTTON SIZING—AN EMPIRICAL PROCESS.

R. H. PICKARD.

In all forms of the modern power-loom the longitudinal cotton threads require some dressing, or size, to lessen the damage liable to be caused by the fraying action of the shuttle. In "pure" goods, the size is merely a starch paste, which, by gumming the loose ends of the fibres of the thread, prevents breakage by the friction of the shuttle. A very large proportion, however, of the Lancashire trade is the export of cotton goods in the "grey" or unbleached condition. Whereas in "pure" goods the size does not amount to more than 5 or 10% in weight of the cotton in the warp, or longitudinal threads, the sizes in the main bulk of the cloth exported in the "grey" may weigh anything from 40, to as much as 150% of the weight of the cotton in the warp.

The market in these "grey" cloths is largely influenced by the demand of the purchaser for a special "feel" and appearance of cloth. The size mixing through which the longitudinal threads are passed and then dried previous to the weaving process is composed of a great variety of materials. For medium or "heavy-sized" cloth the mixing will contain:—

(A) Adhesive substances, usually some form of starch, generally derived from wheaten flour;

(B) Weighting materials, such as china clay;

(C) A softening agent, such as a fatty substance, *e.g.*, tallow, to produce a soft feel, and/or a deliquescent, *e.g.*, magnesium chloride, which has a similar effect; and

(D) An antiseptic substance, such as zinc chloride, to prevent the growth of mildew.

More than a hundred different substances have been used in the production of size. Their specific action, as distinct from their general action, apparently has never been investigated, and the whole process is one in which so-called trade secrets and proprietary articles sold under fancy names loom large. There is a very wide field for research work in this connection. Even the fundamental question as to whether the size penetrates the fibre or is merely plastered on to the thread, does not appear to have been settled. The whole industry has lately experienced great difficulties owing to the restrictions on the use of pure wheaten flour. The Government instructions to millers to add various other cereals to the wheat resulted for a time in the sizer having to deal with so-called wheaten flour containing from 5—15% of maize flour, which is an objectionable constituent of size. These restrictions caused a controversy to ensue among manufacturers as to whether it was possible to do without the use of wheaten flour in the production of every kind of "grey" cloth. It was contended that by the use of starches obtained from other cereals, such as, for example, maize starch, the desired effects could be produced. Wheaten flour is commonly prepared for sizing by one of two methods. Either it is allowed to ferment freely, or it is steeped for a time with enough antiseptic to hinder vigorous fermentation. In this way, a very composite mixture is formed, containing not only starch in a very finely-divided condition, but also various substances, such as dextrines, etc., produced by the fermentation. This thin paste, it is urged, gives to the warp a characteristic feel and appearance which cannot be produced by mixtures made from other flours or starches. These characteristics are particularly desired for certain goods destined for the Indian and Chinese markets. There has been considerable debate as to whether this result could, or could not, be obtained in other ways by the use of various dextrines and "soluble starches." This difficulty is only one illustration of the necessity for research work on the process. Another one arises out of the kind of fat used. Whilst tallow is the commonest, yet other fats and greases are used to produce special effects. Cloth produced in Lancashire may have an entirely different feel and appearance after being shipped through the Red Sea to its destination in India, Java, or China. The consistency and melting point of the fat play a very important part in this matter, and there appears to be a fruitful field of investigation now that fats more or less hardened by the catalytic process can be readily prepared with such varied characteristics. It is probable that the reasons that so little research has been carried out on the problems arising in this industry are mainly:—

(A) The extreme difficulty in research on the causes of such intangible characteristics as the feel and appearance of cotton cloth, properties which do not allow of definite measurement; and

(B) The probability that it would pay no one individual manufacturer to have the research carried out for his own firm.

This, like so many other problems of industrial research, is clearly one in which, for success, a system of co-operation is essential. Many other processes connected with the cotton trade obviously require a thorough, scientific investigation; and it is, therefore, with every wish for success that the proposed formation of the British Cotton Research Association is welcomed.

DYEING "SECRETS"—AND THEIR REMEDY.

The story of the transfer of a large number of German dye recipes from Swiss hands into those of some London merchants is in itself of little importance, but inasmuch as it throws light upon "the psychology of the crowd" and of some of those who write for it, and emphasises indirectly the necessity for an improved system of education, the incident may not be without some useful purpose. The authoritative denial by Prof. A. G. Green and others of many of the circumstances described in the narrative once again attests the vitality of that exuberant growth—human credulity, and the claims that the capture will "free the British industry and scores of other important industries from the bonds of Germany," and "be a notable factor in persuading the manufacturers of Germany that the war has gone against them," not only show ignorance of the traffic in dye recipes which has been flourishing in Switzerland during the war, but illustrate the common fallacy of ascribing an occurrence to a single cause when many have been operative, or that of grossly exaggerating the potency of one cause to the virtual exclusion of all others. It may be, of course, that some of the recipes in question will prove of service to the manufacturers of dyes, but anyone with knowledge of the position and prospects of the industry will not require to be told that many other factors of much greater importance are concerned. The supply of qualified chemists, engineers and labour, the provision of adequate plant, the finding of the necessary capital, the necessity for co-operation among manufacturers and research workers, improved organisation of the industry generally, and the realisation of the fact that German success has been fostered by their business men having some knowledge of science and their scientific men some acquaintance with business—these are considerations compared with which the surreptitious acquisition of trade secrets of unproved worth is as dust in the balance.

The effective means of preventing the occurrence of such regrettable incidents are the spread of useful knowledge and the inculcation of the scientific attitude of mind, desiderata which will require years for their attainment. There are nevertheless one or two palliatives which could be applied without delay, *e.g.*, the extension and development of technical and scientific libraries available to the public; the revival of the high-class popular scientific lecture; and the institution of publicity committees acting on behalf of scientific and technical societies. According to the *Journal of Industrial and Engineering Chemistry* (March, 1917), the American Chemical Society has established such committees in several of its local Sections, the main function of which is to disseminate accurate information by acting in a consultative and advisory capacity to journalists on scientific and technical matters which lie outside their ken. The movement has been attended with encouraging success, and it is to be hoped that the idea will find favour among some of the leading technological and scientific societies in this country.

THE PROFESSION OF CHEMISTRY.

NEWCASTLE.

A meeting of Northern Chemists was held under the auspices of the Newcastle Section of the Society of Chemical Industry in the Mining Institute, Newcastle, on January 12 to consider the proposal to form a local section of the British Association of Chemists. The hall was filled to overflowing. Mr. H. Peile presided, and in his opening remarks said that the Society of Chemical Industry was absolutely neutral in its attitude towards the proposed Association, but considered that the project was one that deserved the fullest consideration. The resolutions to be put before the meeting were quite tentative and could be altered as desired. After Dr. J. T. Dunn had described briefly the aims and history of the Chemical Society, the Society of Public Analysts, the Society of Chemical Industry, the Pharmaceutical Society, and the Institute of Chemistry, Dr. R. B. Forster, Chairman of the Manchester Provisional Committee of the Association, addressed the meeting and emphasised the fact that anything that had been done by the Birmingham and Manchester Committees was quite provisional and subject to revision. He denied the rumour that these Committees intended to monopolise the executive power, and said that the movement must be a national one or it would fail. He was glad to be able to report that Liverpool, Nottingham and Sheffield had signified their allegiance, and that a meeting was also being held in Huddersfield that same afternoon. They did feel that if the Institute of Chemistry could see its way to adopt the ideas of the Association, it would be by far the best solution, but failing this they would go on. The matter was being considered by a committee of the Institute, which was to present its report on January 18.

Mr. R. B. Pilcher, Registrar of the Institute of Chemistry, then spoke of the sympathy of the Institute towards the Association, but remarked that his organisation already covered all the aims of the new body. It was true that they had not touched the great body of chemists in the country, but that was the fault of the chemists themselves. Their doors were wide open to all qualified chemists who would take their examinations. The Institute was not a trade union and never would be as it embraced both employers and employed.

Prof. P. P. Bedson then moved:—

1.—That this meeting broadly approves of the aims of the British Association of Chemists as passed at a meeting held in Manchester on November 10, 1917, and outlined herewith—

(A) To obtain power to act as sole registration authority for all chemists.

(B) To have the word chemist legally redefined.

(C) To safeguard the public by obtaining legislation ensuring that certain prescribed chemical operations be under the direct control of a chemist.

(D) To raise the profession of the chemist to its proper position among the other learned professions so that it may attract the attention of a larger proportion of the best intellects, and thereby secure a supply of highly trained chemists, adequate to the industrial needs of the country.

He did not think that one should be too squeamish as to the use of the word "trade union." Law and Medicine were vast trade unions and anything that would promote the interests of all chemists was highly desirable.

Dr. J. F. Bottomley formally seconded the motion and remarked that organisation was much needed.

Mr. Gaythorne Young said that he could only support clause (D). So long as the average return for medicine was £800 and for chemistry £300, we could not expect to have the best brains of the country in our profession. The other clauses were impossible of attainment or undesirable.

Mr. T. M. Clague spoke on behalf of the pharmaceutical chemist and said that any attempt to filch from him the title of chemist would meet with strenuous opposition.

Mr. C. J. H. Stock remarked that there was little to choose between the aims of the Institute and of the Association.

Prof. H. Louis moved as an amendment for section (A), "That power be obtained by some authority to act as registration authority for chemists as duly defined." He felt that the Institute of Chemistry had failed to recognise the metallurgist and was of opinion that there should be some association with doors wide enough to include every *bona-fide* works chemist. He thought that the works chemist was of the highest national importance.

Dr. J. T. Dunn seconded the amendment, which was accepted by the mover and seconder of the original motion.

After some further discussion the motion as amended was carried *nem. con.*

Dr. J. T. Dunn then moved and Mr. C. H. Ridsdale seconded :—

2.—That this meeting is of opinion that these objects will be best attained through the instrumentality of the Institute of Chemistry, and expresses its hope that the Council of the Institute will see its way to carry them out.

This was carried without dissent.

Dr. S. H. Paterson moved and Mr. A. Short seconded :—

3.—That a committee of twelve be appointed to represent this district in carrying out the aims of the resolutions which shall have been passed at this meeting, and further that it consist of two representatives from each of the following :—

1. The University and Technical Colleges of the district. 2. Metallurgical trades. 3. Chemical trades. 4. Consulting chemists. 5. Gas works, coke ovens and by-product works. 6. Other works' chemists.

This was carried without dissent, and a subsequent ballot resulted in the committee being constituted as follows: Dr. Bedson, Mr. S. H. Collins, Mr. A. Short, Mr. J. Hamilton, Mr. J. Allen, Dr. Fleck, Dr. J. T. Dunn, Mr. H. D. Smith, Dr. G. P. Lishman, Mr. J. W. Porteous, Dr. S. H. Paterson, and Mr. J. W. Craggs.

The proceedings terminated with a vote of thanks to Mr. Peile, Dr. Forster, and Mr. R. B. Pilcher.

HUDDERSFIELD.

A meeting of chemists of Huddersfield and district was held at the Technical College of that town on January 11, with the view to the formation of a local section of the Association. The meeting had been convened by a provisional committee including Dr. Everest, Mr. H. Houseley, Mr. H. R. Dawson, Mr. J. H. Wilson, and others, and there was an excellent attendance.

Dr. Everest, who presided, remarked upon the far-reaching effects of the war upon chemists and the chemical industries, and that this movement for organisation and recognition was one of the results. He trusted that neither there nor elsewhere in connection with this movement would anything be seen of the animosity that had often been heard of as between so-called theoretical and so-called practical men; each of these two types had much to learn from the other. The new Association was not in any way connected with trades union organisation. It was a professional association, to include duly qualified chemists, whether University trained men or men in responsible positions and otherwise eligible according to an alternative standard laid down in a circular issued by the Executive Committee.

The meeting was subsequently addressed by Mr. H. Houseley, who explained what had been done locally in relation to the Manchester meeting; by Mr. R. E. Crowther, one of the joint secretaries to the Manchester Provisional Executive Committee, who enlarged upon the objects of the Association and the conditions of membership, and gave details of negotiations with the Institute of Chemistry, which it was hoped might lead to a combination of the two bodies; and by Mr. J. H. Wilson.

Incidentally, Mr. Crowther remarked with regard to the redefining of the word "chemist," that the Pharmacy Act had been looked into in conjunction with representatives of the Institute of Chemistry, and that it was now regarded as not reserving the title of chemist exclusively to persons qualified under the Act, but as tacitly recognising that there might be other chemists. It was hoped, he added, that if the Association should become the recognised authority for registration, it would finally succeed in raising the level of the examinations for the degrees of B.Sc. and M.Sc., which was not considered in all cases satisfactory.

In reply to Mr. B. Hickson, the Chairman stated that the conveners of the meeting suggested that the area of Huddersfield local section should also include Halifax, Dewsbury, the Colne Valley, Holmfirth, Elland, and Spen Valley districts, and that very probably Leeds and Bradford would combine to form another section. It had also been ascertained that the Institute of Chemistry would not in any way discourage its Associates or Fellows from joining the new Association.

It was then unanimously agreed that a local section be formed, to be called the Huddersfield and District Section, and a subsequent ballot on fifteen nominees for places on a local committee of twelve resulted in the election of the following: Dr. Bramley, Dr. Everest, Messrs. G. H. Frank, J. H. Wilson, L. Mills, J. McKeand, O. B. Burke, H. Houseley, J. S. Parker, H. Royal-Dawson, C. F. Ryley, and G. Mason.

LEEDS.

On January 19, a meeting of Associates and Fellows of the Institute of Chemistry in Yorkshire, Notts., Lincolnshire and Durham, convened by a number of those in practice as analysts in the area, was held at the Queen's Hotel, Leeds, to consider (1) the recent action of the Institute in admitting applicants for the Associateship and Fellowship without examination, and (2) what should be the attitude of the Council of the Institute towards the new British Association of Chemists, which desires to be merged into the Institute with guarantees that its specific objects shall be sought by the enlarged body. Mr. F. W. Richardson, of Bradford, was in the chair, and there was a fairly representative attendance, though many had written that they were unable to attend, and some had indicated in writing their views on the two points for consideration. The intention of the conveners had been to regard the written answers to questions as proxy votes, but the meeting disapproved of this, and decisions were taken by show of hands.

The action of the Council in admitting a large number of Associates and Fellows without examination—183 it was stated at first, but later that the number was nearly 300—was adversely and strongly criticised by the Chairman and others, and Mr. W. Gathorne Young, of Doncaster, held that the proceeding was illegal by the terms of the Charter of the Institute. He (Mr. Young) also submitted that the Charter empowered the Institute to grant certificates of professional competency to analytical, advisory and technological chemists, that it was the only body empowered to do this, and that so long as it continued to do so, and nobody could show that it had failed to properly exercise its functions, it would not be superseded for this purpose. From this it followed (1) that there was no need for a new Association, and (2) that such an Association would not be accepted as an exclusive registration body.

Mr. A. B. Burrell (Leeds) submitted that the Council of the Institute had made a number of serious mistakes—that there was room for both the Institute and the Association in different spheres—and that a great injustice had been done to those who had "shunned delights and lived laborious days" in preparing for the Institute examinations; while the fact that the candidates for admission under the new regulations were required to send their fee with their applications had given rise to a rumour that the diploma of the Institute was for sale.

Mr. R. B. Pilcher defended the new procedure at length. He held that the Council had in no way contravened the Charter; that the new departure was a temporary one under special conditions arising out of the War; that adequate steps had been taken by the Council to verify the attainments of each applicant, and that they were generally of a type to be proud of—some of them D.Sc.'s and men who had done good research work. He also denied that the Council had been "pushed" by the new Association, inasmuch as the new regulations were framed in July, while the Association was not heard of till November.

Upon a motion and an amendment submitted there was further criticism by Messrs. E. Rhodes, C. J. H. Stokes, Peacock, and Capt. Williams and Capt. Foster.

On the other hand, Prof. J. W. Cobb submitted the view that the many men of to-day with academic qualifications and subsequent specialised experience in technological work could not and would not work also for the examinations of the Institute, and that such men ought to be admitted subject to adequate examination of their qualifications. He moved an amendment to this effect, which was seconded by Mr. W. McD. Mackey, but it was outvoted by 16 to 11. The original motion by Mr. Peacock, seconded by Capt. Williams—"That this meeting advises the Council not to proceed further with the election of candidates for the Associateship without examination, unless they have been with His Majesty's combatant forces for one year, and that those Associates who have already been elected without examination, and do not comply with the above condition, should not be allowed to proceed to the Fellowship without a suitable examination"—was not actually put to the vote, although presumably it expressed the opinion of the meeting.

SHEFFIELD.

Closely allied in aims and interests with the British Association of Chemists, yet not directly connected with it, is the "Sheffield Association of Metallurgists and Metallurgical Chemists," an organisation which likewise owes its inception to the determination of scientific workers in industrial pursuits to improve their professional status. To avoid confusion, it is necessary to state that the Metallurgical Association has no connection of any kind with the National Association of Industrial Chemists, which also has its home in Sheffield, and which in some quarters is "accused" of being conducted on "trades union" principles. The objects of the metallurgical organisation are defined as follows:—(1) To provide an association, with local headquarters and library, in which chemists and metallurgists and others interested in the scientific side of the industries of the district may meet together. (2) To deal with local interests in any national or other movement, having for its object the raising of the professional status of scientific workers. Apart from these main objects, the Association intends to co-operate with other similar organisations to form a National Applied Science Association. There are several grades of membership, viz., (1) *Full Membership*, open to men of 24 years of age with academic qualifications who have had three years' experience in a recognised laboratory or in some approved metallurgical department: and also to those without a diploma who are of good professional standing, have had over eight years' responsible work, and are possessed of sufficient theoretical knowledge. (2) *Associate Membership*, for those similarly qualified who are between the ages of 21 and 24. (3) *Associates*. This grade is intended expressly for men who are not qualified for (1), but who hold responsible technical positions and are fitted to take part in the discussions and enjoy the amenities of the Association. Honorary members may also be elected, and at a later date the question of admitting student members will be considered. The right to vote is restricted to full members. An excellent feature of the programme is the formation of a club in which the scientifically trained men will have the opportunity of fraternising with other industrial workers holding responsible positions, such as members of works' staffs, who will be eligible for club membership. Such an arrangement should be beneficial to both parties and do much to promote that sense of mutual dependency and good fellowship upon which the success of industrial organisations so largely depends. Dr. W. H. Hatfield is the President of the Association, and Mr. G. R. Bolsover the Honorary Secretary.

OFFICIAL NOTICES OF THE SOCIETY.

THE SOCIETY'S NEW OFFICES.

The headquarters of the Society are now at—

CENTRAL HOUSE,
46 & 47, FINSBURY SQUARE,
LONDON, E.C.2.

TELEPHONE: LONDON WALL 7331.

TELEGRAMS: INDUCHEM, FINSQUARE, LONDON.

SPECIAL NOTICE TO MEMBERS.

Members are reminded that the Annual Subscription due on 1st January, 1918, is 30s., not 25s. as in the past.

It is requested that cheques should be made payable to the "Honorary Treasurer" of the Society, and should be forwarded to him at the Society's Offices (see above).

COUNCIL MEETING.

The next Meeting of the Council will be held on Friday, 22nd February, at 5.15 p.m., in the Society's New Offices.

ARTIFICIAL MANURES.

Lecturing on this subject at the London School of Economics on January 18, Sir A. D. Hall, Permanent Secretary to the Board of Agriculture, both began and ended his remarks by referring to our defective system of education as the primary cause of the failure to use sufficient quantities of artificial fertilisers and to apply them in a scientific manner. Out of a total yearly production of about 2·75 million tons of Chili saltpetre before the War, Germany took about 750,000 tons, whereas Great Britain only imported 80,000—100,000 tons, of which about 60,000 tons were used in agriculture. Our pre-war production of ammonium sulphate amounted to some 400,000 tons, two-thirds of which we exported. At the present time, about 250,000 tons are available for the land, only a very small quantity being exported to Spain in exchange for potatoes consumed by our Armies in France. Germany is now manufacturing cyanamide at the rate of 400,000 tons per annum (against a pre-war production of 30,000 tons), and 500,000 tons of ammonia by the Haber process for the production of explosives. Very large quantities of ammonium nitrate are being produced in this country, and after the War this material should be of great service in agriculture, as it is a most concentrated form of available nitrogen, and its continued application does not produce the "sickness" of the soil which follows from the prolonged application of ammonium sulphate or sodium nitrate.

During last year, the supply of superphosphate was practically cut off owing to lack of tonnage and scarcity of the sulphuric acid needed in its manufacture; the immediate outlook, however, is much brighter, as acid can now be obtained and some phosphate rock can be shipped. Our pre-war production of basic slag was about 400,000 tons, of which 280,000 tons were used in the country. We are now making some 500,000 tons, but with a lower percentage of available phosphoric acid (12—13% compared with 17%). Before the War, Germany was producing 2,250,000 tons; Luxembourg, 250,000 tons; Belgium, 655,000 tons; and France, 750,000 tons.

Our farmers have never used sufficient potash fertilisers; the average amount imported annually from Germany—100,000 tons containing 23,000 tons of K_2O—was much below our requirements, 40,000—50,000 tons K_2O at least being needed. The recovery of potash from blast furnace gases would go some way towards meeting the present shortage. In the process used, the dust filtered from the gases was deposited in three series of chambers, in the first of which a heavy black dust containing 2—3% of K_2O was precipitated; in the second, a finer brick-red dust with about 7% K_2O; and in the third, a cream-coloured powder with an average content of 10% K_2O. The potash recovered is soluble to the extent of about 50% in water, and consists of sulphate with a little chloride. It was estimated that a blast furnace would produce annually 20 tons of black dust, 5 tons of red dust and 1 ton of cream dust, and that a maximum of 15,000 tons per annum of potash from this source could be expected. It could be sold at 10s. per unit of potash. Of the possible foreign sources of supply, the Spanish deposits in Catalonia had been controlled to a large extent by German interests; and although the Spanish Government had declared its foreign agreements in this connection as null and void, the fact remained that the mines were not being worked. Probably some years would elapse before the potash found in Abyssinia could be marketed, as the site of its occurrence was waterless, it was situated 100 miles from the Red Sea, at present there was no railway communication, and there were various international interests to be considered. The success of the process of extracting soluble potash from Cornish felspar was, to a large extent discounted by the fact that the yield was very low in proportion to the amount of white cement obtained as by-product, 100 tons of felspar giving about 8 tons of potash and 200 tons of cement, and the market for the last was limited as it was only suitable for indoor purposes.

As regards the post-war future, there should be no difficulty in increasing our supplies of nitrogenous fertilisers; we shall produce much larger quantities of phosphates than we did before; and the future of our potash supply, although dark, is not without hope.

In answer to the question: Could we augment our home-production of artificial fertilisers? the only answer was: We must—and the minimum quantities needed are 750,000 tons of superphosphates, 280,000 tons of basic slag, and 150,000 tons of concentrated nitrogenous fertilisers.

NEWS FROM THE SECTIONS.

BRITISH COLUMBIA.

The first general meeting of this newly-formed Section was held in the University Club, Vancouver, on November 28, 1917. Mr. J. A. Dawson, the Chairman of the Section, presided, and there was a good attendance of members, members' guests, and guests of the Section, among the last-named being representatives of the University of British Columbia, the Vancouver Board of Trade, the Manufacturers' Association, the Canadian Society of Civil Engineers, and the Vancouver Institute. After Mr. Berkeley, Chairman of the Programme Committee, and Mr. Eldridge, speaking for the Membership Committee, had presented their reports, the Chairman called on Dr. Wesbrook, of the University of British Columbia, to deliver his address on the subject of "Science and the War." The speaker first dwelt on the interrelations of various departments of pure science, and then indicated the interdependence of their technological branches, using, by way of illustration, their applications in the conduct of war, either for purely destructive purposes or for the alleviation of human suffering. In reviewing the scientific facts upon which various war inventions were based, he pointed out that the discovery of these facts was traceable very largely to scientists of the allied countries. Dr. Wesbrook then spoke at some length on the question of co-ordination in education, and urged that the great need of the Empire at the present time was a proper relationship between the educational systems of Great Britain and the Overseas Dominions. One of the greatest lessons of the war was the need for educational reform, particularly from the Imperial aspect, and he strongly advocated the holding in London of an "Imperial Educational Conference."

A short discussion, in which Messrs. Hayward, Cunningham, Law, and Dr. Scott took part, then followed, and the meeting closed with a vote of thanks to Dr. Wesbrook for his valuable address.

LONDON.

At the meeting of the London Section held on Monday, January 7, the Chairman, Dr. Charles A. Keane, announced that Mr. T. D. Morson, the honorary secretary and treasurer of the Section, had been compelled to resign his office owing to the increasing demands of his business engagements, and that Mr. Stephen Miall, LL.D., B.Sc., had been elected as his successor. A very cordial vote of thanks was accorded to Mr. Morson for the valuable services he had rendered to the Section with such

conspicuous success during the past five years, in reply to which Mr. Morson stated how much he regretted that circumstances had necessitated his retirement from a post in which he had enjoyed so many pleasant associations.

The first paper of the evening was by Mr. T. D. Morson on "The Toxicity of Methyl Alcohol in Relation to its Industrial Uses." The importance of pure methyl alcohol in chemical industry, and the economic difficulties which hinder the development of manufactures for which it is required, had instigated a detailed examination of the literature on its toxicity, with the object of bringing home to the authorities concerned the desirability of placing it at the disposal of manufacturers without Excise restrictions. The toxicity of methyl alcohol has remained, up to the present, a disputed point in this country, but the evidence that has been collected on the subject, especially in America, has so fully established its poisonous action that the continuance of its classification as "plain spirits" was neither justified nor desirable. It was suggested that had methyl alcohol been called by some less alcoholic name it would not have been placed in the category of "spirits" at all, and that henceforward it should be known by its structural name of "Methanol," and should be labelled "Poison." Also that as a further safeguard the Customs Board should be authorised to sanction its use under the conditions that apply to that of industrial alcohol, and free from all further taxation and Revenue control. The importance of pure methyl alcohol as a "key" chemical in the manufacture of dyes and of medicinal chemicals was dealt with both from the standpoint of processes in which its use is essential and of those in which it possesses advantages over industrial methylated spirit or other duty-free solvents. The index and abstracts of the literature on the toxicity of methyl alcohol appended to the paper will form an invaluable source of reference on the subject.

The second paper of the evening was contributed by Messrs. T. F. Harvey and C. F. Sparks on "The Rapid Estimation of Pyridine in Ammonia." The method, which was devised by the authors for the estimation of small quantities of pyridine or pyridine bases in ammonia, depends upon their complete precipitation as periodides, and the subsequent titration of the sulphate of the base by standard alkali. The process is convenient and rapid, and will be of distinct use in analytical practice, as no reliable and rapid method for this estimation has been hitherto published.

The concluding paper by Prof. J. S. S. Brame, on "Corrosion of Lead Roofing," described two interesting cases of corrosion of sheet lead used for roofing purposes. In the one case cast lead-sheets had been in position on a wood foundation for a long period and serious corrosion had occurred where it had been in contact with oak, with the formation of crusts of a deposit having the composition of commercial white lead. The corrosion in the second case had taken place where the metal had been laid on a coke-breeze concrete. The action had been somewhat rapid, and patches of a thick crust of a red deposit, consisting chiefly of lead monoxide, with a small proportion of red lead, had been formed, which was regarded as due to the action of the free lime in the cement.

A second paper by Prof. Brame, on "The Action of Rain-water on a Portland Stone," was, owing to the lateness of the evening, taken as read.

MANCHESTER.

A very fully attended meeting of the Section was held on January 11, when Mr. L. Stanley Jast, the Deputy Chief Librarian of the Manchester City Libraries, read a paper upon "The Technical Library." Mr. Wm. Thomson presided. Mr. Jast stated that perhaps the best definition of a real library was "a collection of books made productive." Books should be a means of obtaining information readily, and they should be accompanied by properly constructed catalogues, indexes, and other keys, the whole being under the control of skilled custodians, who were able to bring together enquirer, keys and material into an effective working relation. The mere size of a library was not a true measure of value. In a general way the technical book might be defined as a book which dealt with a useful art, which art nowadays was usually an applied science. A technical collection, if separated from a general library, was maimed, and therefore the two should be housed under the same roof. When, owing to special circumstances, it was decided to have a certain amount of separation, the disadvantage should be lessened by a duplication of some of the material (*e.g.*, Government publications), and by a system of messenger exchange. The learned and scientific societies would do a great public service by placing their separate collections under the control of the municipal Libraries Committees. Books gained immensely in value when brought into relation with other books. It was not creditable to a manufacturing and commercial people that, apart from the splendid library of the Patent Office, in London, there were practically no technical libraries in the country.

During the course of a protracted discussion it was mentioned that such books as Friedländer's "Progress of the Coal Tar Industry," Winter's "Patents of Organic Chemistry," and Beilstein's "Organic Chemistry" were not easily obtainable for purposes of reference in Manchester. The German Government, by the almost lavish equipment of libraries of technological works, had immensely facilitated the studies of their own scientists and students, and their value was enormously heightened by a system of book-exchange between the various towns. An enquirer could always obtain any particular book he required with a delay of at most a few days. In this country it was frequently necessary to travel to London in order to consult a work of reference. German publishers were more disposed to publish books on scientific subjects, owing to the provision made by the Government for their purchase and installation in the numerous libraries of the country, thus eliminating to a large extent the element of speculation, and possible financial loss on the part of the publisher. It was necessary that the reader of books on scientific subjects should have personal access to the shelves of the library, as was done in the Patent Office Library in London. German libraries were classed in groups, which were compelled to include books on specified subjects in their collections. It was highly desirable that the wealthy business men of Manchester should subscribe generously towards the equipment of a technical library, and thus come to the assistance of the Municipal Libraries Committee, which had to keep its total expenditure within the limits of a rate of 2d. in the £. The views put forward were strongly endorsed by Alderman Abbott, a member of the Municipal Libraries Committee, and finally the section unanimously resolved to cooperate with the various learned and scientific bodies of the city in sending a deputation to the Lord Mayor, with a view to obtaining the assistance of the Corporation in the desired direction.

EDINBURGH.

With the intention of affording more opportunity for intercourse and discussion than is possible at an ordinary meeting, the local committee decided to make the meeting convened for January 15 of an informal character. For this

purpose a series of short papers or notes on apparatus and experimental methods was arranged, and the results fully justified the action of the committee, for there was a good attendance, keen discussion, and much interest aroused by the exhibition of apparatus. The subjects selected were as follows: Modifications of Kjeldahl's method for the estimation of small quantities of nitrogen; notes on the estimation of nitrogen in rubber by Kjeldahl's method (M. Howie); estimation of lactic acid in organic fluids—illustrated by lantern slides (J. S. Ford); a new laboratory centrifugal machine, and its application to various problems (Dr. D. S. Jerdan); an improved method for illuminating the scale of a balance (B. D. Porritt); the evaporation of ethereal solutions (D. B. Dott); and an improved form of Bunsen valve (J. G. Annan).

NEWCASTLE.

On January 16, Mr. Henry Peile (Chairman) presided over the usual monthly meeting of this section. On this occasion Mr. G. W. Hewson (Chief Chemist at Messrs. Palmer's Iron and Shipbuilding Co., Ltd.) read a paper on "Coke as a Fuel for the Blast Furnace." He reviewed the various conclusions that had been arrived at by other workers in this field, and as a result of his own experience said that uniformity in the fuel, both as regards its physical and chemical properties, was what the blast furnace manager sought. He indicated how a comparatively small variation in the percentage of ash in the coke might very easily render the iron produced relatively useless. He then described the method of calculating the amount of "available" carbon in coke, each 1 per cent. of ash requiring half its weight of carbon to melt the slag which it produces, and each 0·1 per cent. sulphur requiring $\frac{8}{10}$ths of its weight of carbon.

The method he favoured for determining the hardness of coke consisted in revolving a weighed quantity of dried coke (sized between 1 inch and $\frac{1}{2}$-inch mesh) in a 26-in. diam. drum with a dozen cast iron balls $1\frac{1}{4}$-in. diam. for one hour, in which time 1000 revolutions took place. The coke was then withdrawn, passed through a $\frac{1}{2}$-in. mesh sieve, and that remaining on the sieve was weighed and calculated as a percentage of the original weight. He then exhibited a table, showing the ash, sulphur, fixed carbon, available carbon and hardness numbers. Any coke with a lower hardness number than 94 was considered unsuitable.

In the discussion which followed, Mr. G. Weyman remarked that it was an exceedingly rare thing for the coke maker to get regular ash content in his supplies of coal, and that out of a train load of 15 trucks from one colliery, the trucks varied in ash content from 3 per cent. up to 24 per cent.

Messrs. E. F. Knott, W. Diamond, A. Short, C. H. Ridsdale, Dr. Paterson, Dr. Dunn and the Chairman also took part in the discussion.

CORRESPONDENCE.

THE NEW PATENTS BILL.

Sir.—In your issue of January 15, you published a digest of the Patents and Designs Bill at present before the House of Commons. It is not my object at the moment to discuss the Bill as a whole although I could find much to say in favour of it, as it seems to go a long way towards solving the knotty problem of how to deal with those who, both, abroad and at home, seek to use the Patent Law to hinder industrial development elsewhere than in their own works. There is, however, one clause in the Bill which the chemical industry will certainly oppose. I refer to Clause II., the first part of which reads as follows:—"In the case of inventions relating to articles or substances prepared or produced by chemical processes, or intended for food or for medicinal or surgical purposes, the specification shall not include claims for the product, substance or article itself, but only for the special methods or processes of manufacture." Whatever may be the wisdom of this provision so far as it concerns substances for food or for medicinal or surgical purposes, there can be no doubt but that it is a retrograde step so far as it refers to substances in general produced by chemical processes. It means that when the Bill becomes law, it will no longer be possible to hold a patent for a chemical product, so that the inventor of a new substance having valuable properties will not be able to obtain patent monopoly in it but only in the process known to him for producing it. As soon as his product becomes a part of public knowledge it will be open to anyone to make it by some process slightly different from that described and claimed in the patent specification. Such a limitation to patent monopoly in chemistry has long been the law in Germany, but there is not the slightest reason for copying a German law in this respect. Indeed, to do so would be a subversion of the object which all chemists are seeking, namely, the development and extension of research. To the chemical industry, the patent law is of value in direct proportion as it encourages research and the publication of inventions. What incentive does the law offer for research if, on a new product being obtained, the only patent which can be granted for it affords the minimum protection? If it be argued that the proposed change of the law is to prevent foreign competitors from holding broad patents for products which they import into this country, my opinion is that the provisions of the Bill in respect of the position of patentees who import but do not manufacture are quite sufficient to prevent the recurrence of any abuses which have prevailed in the past.

I am, Sir, etc.,

A Member of the Society of Chemical Industry.

MEETINGS OF OTHER SOCIETIES.

THE FARADAY SOCIETY.

The Setting of Cements and Plasters.

A general discussion on the above subject was held on January 14, both in the afternoon and evening, in the rooms of the Royal Society of Arts, Mr. James Swinburne, Past-President, in the chair. Nine communications were read and discussed. In his opening remarks on "The Mechanism of the Setting Process in Plaster and Cement," Dr. C. H. Desch pointed out that the setting of plaster was essentially a recombination of $CaSO_4$ with water. According to H. Le Chatelier (1887), the hemihydrate $2CaSO_4,H_2O$ readily dissolved in water, and the unstable solution, supersaturated as to the dihydrate, deposited spherolitic crystals of gypsum, chiefly about nuclei of unburnt gypsum, the strength of the plaster depending mainly on the interlocking of the crystals. This view corresponded with the main facts; but there was evolution of heat at two stages (Cloez), further expansion and thrusting apart of the crystals, also contraction, and the original crystals need not be those of gypsum (W. A. Davis). Other salts

present might accelerate the hydration, if increasing the solubility (*e.g.*, potassium sulphate), or retard it, if diminishing the solubility (*e.g.*, borax, Rohland); colloids retarded the setting. According to Rohland, the salt took up the water in a colloidal form, and that applied generally to powdered and moistened salts. Solutions of zinc oxide and magnesiun oxide in their chlorides hardened in similar ways. The hardening of mortars was a desiccation process; the formation of carbonate was not essential to the hardening: lime silicate was not formed, but the soluble silica of volcanic earths, etc., was an essential constituent. Portland cement was a more complex material. The clinker (compare Rankin, below) might contain trisilicate $3CaO.SiO_2$, or the disilicate, tricalcium aluminate $3CaO.Al_2O_3$, further penta-aluminate and free lime. Not more than three of these could be in equilibrium, but as the components were not fused, they might all be present in the clinker. The existence of two ternary eutectics had been proved in etched specimens—simple optical examination of a thin section would not show them—by Desch and Hattori. The view of Le Chatelier (see below) was opposed by W. Michaelis who, while assuming the same general reactions, considered that the hydrated metasilicate formed a gel which gradually dried and hardened. This was supported by Stern, Ambronn, Colony, and by the straining tests of Keisermann and of Wetzel and Blumenthal. The grain size was important in distinguishing the stained constituents (Desch). The hydration of the clinker had chiefly been studied by the Bureau of Standards (see below Klein). The initial set seemed to be due to the hydration of the aluminates; the silicates hydrated much more slowly, but down to the liberation of gelatinous silica; the subsequent crystallisation resulted rather in a loss than in a gain of strength. Le Chatelier had largely relied on the behaviour of mixtures of ground material with water on the microscope slide. In practice little water was present, and the ratio, cement to water, was important for the nature of the products. According to Weimarn, the passage from the colloidal to the crystalline condition was continuous; the subdivision in colloids was so fine that surface forces became comparable to mass forces, and it would depend upon the degree of supersaturation, whether the separating product was crystalline or colloidal. Thus the two rival theories would approach one another. The influence of catalysts on the setting, and the remarkable acceleration in the velocity of setting, sometimes observed in ground cements, stored even out of contact with air, were not understood.

Prof. H. Le Chatelier, in his sent communication on "Crystalloids against Colloids in the Theory of Cements," declared it to be devoid of sense to attribute the hardening to colloidal properties, since people did not define colloids, but took the term in the sense of a body capable of hardening. Colloids had two commonplace properties, fine subdivision and insolubility. If a gram-mol. of water, a single sphere of 3·3 cm. diameter, were divided into spheres of 1^{-6} mm., the surface energy would be raised from $6{\cdot}3 \times 10^{-3}$ kg. cal. to 2 cal., and thus become of the order of the energy liberated by the hydration of lime. When fine particles were in contact with a liquid, in which they were partly soluble, those forces came into play, and the colloidal properties were lost. In set plaster even the microscope did not disclose any crystals, but they might be too small merely for visibility; a plaster gauged with alcoholic water soon showed crystals. Rapidly-set cement did not show crystals either, but they were quite distinct when ground calcium aluminate was immersed in water. Calcium silicate never seemed to crystallise—that was his difficulty—but barium silicate and other analogies suggested that the crystals were merely too small. In any case the colloidal state, possible only in the beginning, could have nothing to do with the hardening. The unstable anhydrous compounds formed supersaturated solutions when in contact with water, from which hydrates crystallised; the liquid being no longer saturated —why?—could again dissolve anhydride, and the whole mass thus passed progressively through a stage of transitory solution in a limited volume of water. The strength of the spherolitic crystals was that of a tissue or fabric.

Professor T. J. Donnan wrote on "The Agglomeration of Granular Masses" (caking, binding, setting), when immersed in a solvent or wetted with it, and on the four factors which favoured the formation of a solution and reprecipitation in amorphous or crystalline state, even from molecular layers of solution: unequally distributed stress, unequal size of grain, existence of metastable or unstable forms, and sheaved or "flowed" crystal surfaces (Beilby effect). These forces were generally important in chemistry, and the reprecipitated material would be so finely granular as to be practically colloidal.

The two contributions from America—G. A. Rankin, "On the Setting and Hardening of Portland Cement," and A. A. Klein "On the Constitution and Hydration of Portland Cement"—gave detailed accounts of the systematic work done at the Geophysical Laboratory and the Bureau of Standards; the two authors are not quite in agreement in their conclusions, but they both emphasise the importance of gelatinous silica. Rankin discusses how the silica percentage might be increased, and Klein draws attention to sulphuroluminate, $3CaO.Al_2O_3.3CaSO_4.xH_2O$. Mr. Bertram Blount, in his "Notes on the Setting of Cement in its Relation to Engineering Structures," regretted the elasticity of the terms cement, setting, and time of setting; cements were tested neat, though never used neat. Mr. J. A. Rhodin connected his remarks on the question "Is the Setting of Cement mainly a Physical or a Chemical Process?" with observations he had made when treating felspar with lime, salt, and steam to render the potash soluble; the resulting silicate of lime and alumina behaved like a zeolite and could be transformed into a good cement by treating with more lime.

Messrs. E. Deny (Ghent) and E. H. Lewis, in "The Effect of Adding Suitable Slag on the Setting Properties of Portland Cement," described experiments, made in this country, supporting Passow (Die Hochofenschlacke der Zementindustrie). Their slag (49 per cent. lime, 31 silica, and 15 alumina from the coal) had itself good setting properties, and gave, mixed with lime and clay, a good cement; such cements were quick-setting (owing to the high ratio of alumina to silica), but that could be modified and strength be secured at the same time by the use of suitable limestone and the addition of granulated slag. Good results were obtained by mixing their cements with Wishaw blast-furnace slag (70 cement, 30 slag), and further with slag and four brands of cements. The high alumina content admitted of using high-lime percentages without fear of expansion; analyses of the final products were not given in the paper.

In his paper on "Ancient and Modern Cements," Mr. W. J. Dibdin referred to his researches for the Royal Institute of British Architects in 1907 to 1910. He found 1 lime (CaO) to 1 aggregate (volume ratio) in some ancient mortars, but had not tested that ratio. In mortars (lime with different English sands) he observed greater strength in the 1 : 2 than in the 1 : 3 mixtures, showing that the reduction of the lime percentage impaired the quality. In some cases the addition of clay had distinctly increased the strength.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

On January 15, Capt. T. S. Masterman, D.S.O. gave a general sketch of "The Petroleum Industry of Rumania," dealing chiefly with the geology of the oil-bearing district and the development of the industry, with comments on the system of land tenure as it affects the oil concessions. The following figures indicate the extent of progress made during the last twelve years :—

	Tons.		Tons.
1904.........	500,561	1910........	1,352,407
1905.........	614,870	1911........	1,544,847
1906.........	887,091	1912........	1,804,761
1907.........	1,129,297	1913........	1,885,225
1908.........	1,147,727	1914........	1,783,947
1909.........	1,297,257	1915........	1,673,145

In the year 1915 the whole industry comprised about 2100 borings, of which 48 per cent. were more or less productive, 18 per cent. were drilling and repairing, and 34 per cent. were held in suspense or abandoned.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

On January 8, the President, Mr. Wm. Thomson, read a paper on "Somatose," a substance prepared by dissolving the refuse from meat which has been extracted with water to make meat extract. This refuse was formerly thrown into the sea in S. America, but a German chemist found that he could partly dissolve it by heating with water under a pressure of 90 lb. per sq. in., *i.e.*, at 160° C. After filtering, evaporating and powdering, Somatose was left as a horny grey mass ; and it was claimed that this substance had a considerable dietetic value. The author experimented by feeding tame mice with oats and Somatose and with oats and lean beef, and found that the animals did not thrive upon the former mixture. He drew the conclusion that Somatose was better classed as a poison than as a food.

THE CERAMIC SOCIETY.

At a meeting held at Stoke-on-Trent on January 19, two short papers were communicated, by title : "Microscopic Study of the Bone China Body," by Prof. H. B. Cronshaw, of Galway, and "Refractory Properties of Magnesia," by Messrs. H. Le Chatelier and B. Bogitch (both of which will duly appear in the Society's Transactions). Mr. A. E. Gray then read a paper, entitled "The Encouragement of Art in the Potteries."

At the end of the meeting it was decided to form an Art Section, to be concerned mainly with the decorative side of pottery for commercial purposes.

SOCIETY OF GLASS TECHNOLOGY.

The January meeting of the above Society was held in the Music Theatre, Stourbridge, on January 16, 1918, the chair being taken by Mr. Williams Thomas.

The first paper, on "The Durability of Heavy Lead Potash Glass," by J. D. Cauwood, W. E. S. Turner, and Duncan Webb, was communicated by the first-named.

Prior to 1870 large quantities of lead glasses were used for chemical ware. Nowadays lead in chemical ware is practically non-existent, and only one glass out of many used was found on analysis to contain it. The authors have carried out durability tests on certain glasses containing a high percentage of lead to find how far they were resistant to the action of solvents. A summary of the results of workers in the past was given, and it was found by most of these workers that the lead glasses were highly resistant to water and acids and fairly resistant to the action of alkalis.

The two glasses tested were : a window glass made in 1845 and which, although it had been exposed to weathering conditions for more than 50 years, showed no diminution in brilliancy ; and a glass tumbler made in the early fifties which had also lost none of its brilliancy.

These specimens were subjected to five separate tests and the results showed that they were quite satisfactory from the point of view of both weathering and the attack of reagents.

The second paper, entitled "Notes on the Annealing of Glass," by S. English and W. E. S. Turner, was read by Mr. English.

Investigations had been carried out on two particular glasses by a special method which was described, and it was found that 620° C. was the temperature at which the strain rapidly disappeared from one glass, 460° C. for the other. The effect of temperature on annealing was also investigated. Thus in the case of one glass, annealing was complete in 6½ hours at 400° C., in 2½ hours at 425° C., and in 12 minutes at 450° C.

As the method outlined was a laboratory one involving expensive apparatus, a more simple method involving the measurement of bending rods of glass had also been worked out. It was found that the temperature at which a glass showed rapid bending without actual softening corresponded to the actual annealing temperature.

The third paper, on "An account of a new Blowpipe with pre-heated gas," was read by W. A. Whatmough, and the fourth paper by S. English dealt with "A new variable Jet Blowpipe" ; in both cases the instruments were shown in actual use.

INSTITUTION OF MINING AND METALLURGY.

The members of this Society met on January 17 to hear a paper on "The Incidence of Taxation on Metalliferous Mining in the British Isles" by Prof. H. Louis, and another on "Molybdenum in Norway," by Mr. E. R. Woakes. Prof. Louis contended that among the most potent causes of the decline of British metalliferrous mining are the misdirected and inequitable methods of taxation adopted by our fiscal authorities. He reviewed briefly the effects of income tax, local rates, mineral increment value, mineral rights duties, and additional mineral rights duties upon mining, and emphasised the cardinal difference between a mine, which is a wasting asset, and other forms of capital of a permanent character. Another serious drawback to mining enterprise is the totally inadequate allowance made for the depreciation of mining machinery.

The paper on molydenum contained an account of the nature of the deposits of molybdenite in Norway and of the various mines which are being worked. Provided that the post-war price does not fall below £4 per unit of MoS_2, their combined output should not fall below 100 tons per annum.

Graphite in Madagascar.—The South African Mining Journal states that the output of flake (crystalline) graphite in Madagascar is developing very rapidly. In 1907, 8 tons only were mined ; in 1911, 1246 tons ; in 1915, 11,851 tons ; and last year 25,489 tons. The crystalline schists carrying the mineral are said to occupy over 200,000 sq. miles.

NEWS AND NOTES.

AUSTRALIA

Professor Lefroy, the scientific officer of the British Wheat Commission, states that stacks of wheat in various States are badly infested by weevil, but a practical system is known that will restore them to a thoroughly good condition. No further loss is anticipated.

It is stated in the Sydney press that negotiations between Lysaghts, Ltd., and the management of the Broken Hill Company's Newcastle Steel Works for the supply of metal for the manufacture of galvanised iron have reached a forward stage. It is further intimated that Lysaghts intend establishing a plant adjacent to the Newcastle Steel Works at an ultimate cost of £150,000.

CANADA.

The collieries in the Crow's Nest Pass district of British Columbia, which are now operated under Government control, are producing 23,000 tons of coal per day, the greatest output in the history of the Province. Everything is running smoothly at the collieries.

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The Imperial Trade Correspondent at Toronto has recently reported that the Ontario Hydro-Electric Power Commission has now in hand preparations for the establishment of an extensive electric generating plant at Chippewa Creek, near Niagara Falls, Ontario. The Commission, which is a department of the Ontario Government, is at present only engaged in transmitting electric power from producing companies at Niagara Falls to customers throughout the Province who take the current and distribute it. With the establishment of the generating plant the Commission will be in a position both to generate and distribute power. It is first proposed to construct a canal between Chippewa Creek and Queenstown, Ontario, at an estimated cost of 9,000,000 dols., after which the power-house will be built and the plant installed.—(*Bd. of Trade J., Dec.* 20, 1917.)

SOUTH AFRICA.

The *Cape Argus* of August 27, 1917, contains a highly eulogistic article on the lately-discovered talc deposit at Noordkaap in the Barberton district, Transvaal. The quality of the mineral is stated to be of the very finest, a mill has been erected, and many orders have been received from manufacturers. The lack of shipping facilities is responsible for retarding exports, but the Union-Castle Company has under consideration the advisability of allotting about 20 tons to every steamer leaving South African ports.

The deposits of tinstone at Roodeval, Olifants' River, the property of the Union Tin Mines, Ltd., have recently been investigated by Mr. E. Cass, formerly Chief Field Inspector to the Queensland Government. According to the *South African Mining Journal*, a preliminary report of a very favourable nature has been made.

GENERAL.

Empire Sugar (Technical) Committee. (Soc. Chem. Ind.).—Although there has been no meeting of this Committee since May 23, 1917, the executive officers have by no means been idle. At the last meeting it was decided to obtain information from the various units of the Empire not only as to their existing sugar production, but also as to their power of possible production, the nature and economics of their consumption, and the facilities available for technical training and research. In order to secure uniformity, this information was sought by means of specific questions. All the Dominions, Colonies, Dependencies, Possessions and Protectorates of the Crown were communicated with, and it is gratifying to be able to state that the response has been of the most satisfactory character. After the mass of information obtained has been collated, a meeting of the Committee will be called to consider it; and, in view of the great public value of the information obtained, the question of the issue of an interim report will also come forward.

The consideration of matter already available on the subject of beet sugar production in the United Kingdom and the obtaining of additional information thereon will form the next step in the work of the Committee.

Colloid Chemistry and its Industrial Application.—A first report on this subject has just been issued by the British Association for the Advancement of Science. The Committee responsible for the publication was appointed at the Newcastle meeting of the Association in 1916, as a result of the interest shown in a paper read by Prof. W. C. McC. Lewis before the Liverpool Section of the Society of Chemical Industry a few months previously. The Committee states that the report was prepared with the objects of emphasising the empirical nature of many of the operations employed in technical colloid chemistry, of indicating the necessity of a vigorous prosecution of research work, and of rendering available the information which is believed to exist among chemical technologists at the present time, but which, from its possibly uncoordinated nature, is not regarded as suitable for publication through the ordinary channels. The report is published by the Association (Burlington House, W.1), and the price is 2s. net.

Water Power Development.—The British Aluminium Company is applying to Parliament for a Provisional Order for powers to carry out works for a large extension of their hydro-electric plant at Kinlochleven. The drainage areas proposed to be utilised are those of Loch Laggan, the River Ossian, and Loch Trieg (tributaries of the River Spean in Inverness-shire), and part of the drainage area of the River Spean below its junction with the River Trieg, comprising in all over 200 square miles of drainage area. The water from these areas is to be diverted by means of tunnels to Kinlochmore on the opposite side of the River Leven from the Company's works at Kinlochleven, where a fall of about 750 feet will be obtained giving a possible development of 40,000 continuous horse-power and 27,000 horse-power if compensation in water has to be given to the River Spean. The Company seeks to acquire some 156 acres of ground at Kinlochmore for the erection of a power-house and the extension of their works. This is one of the most important sites for water power in the country, and the possession of the ground at Kinlochmore will give the Company control over another possible development of water power nearly as large as the one now proposed to be developed.

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Fat Shortage in the Textile Industry.—A representative meeting of local tallow refiners was held in Manchester on January 8, with the object of forming an association to bring before the Director of Oils and Fats (whose work is under that of the

Food Controller) the need for retaining the raw materials required by tallow melters and essential for sizing and lubricating. The meeting, which was held in private, resolved to form the association under the title "The North of England Tallow Refiners' Association," and a Committee was appointed with Mr. R. Critchley as chairman, and Mr. F. Burton as secretary. In a subsequent interview, Mr. Critchley explained that the shortage complained of was due to the fact that fats hitherto used for technical purposes were now being reserved for the preparation of foodstuffs. Much of the fat so diverted was unsuitable for food, and, on the other hand, much of the material suitable for nutrition had been employed in the textile industry. Mr. Burton said that the Association had a scheme to increase the supply of fats available for both purposes.—(*Manch. Guard.*, *Jan.* 9, 1918.)

Peat Fuel.—An appendix to the second report of the Select Committee on National Expenditure contains information concerning the proposed use of peat briquettes by the British Armies in France. Tests were made upon briquettes supplied by Wet-carbonising, Ltd., and the reports pronounced them to be satisfactory for trench warfare and economical in transportation. The Advisory Committee on Army Contracts considered the matter on various occasions in 1917. The Company proposed that the War Office should advance £50,000 for the adaptation and re-starting of their factory at Dumfries, the sum to be secured by a first charge on the whole property. The output was estimated at 170 tons a day, and the cost 35s. a ton at the factory. They also proposed a second scheme for the erection of a small factory in France, capable of an initial output of 100,000 tons a year and of expansion to 300,000 tons. The estimated initial cost of plant was £100,000, which was to be advanced by the Government, the factory to be Government property. The cost of the briquettes was to be 40s. a ton. As the probable saving in fuel was estimated at only £30,000 a year, the Advisory Committee was of opinion that as a financial proposition it was not worth pursuing, but as a means of saving tonnage it was to be recommended. The recommendations were not accepted in detail, but an amended scheme, substantially on the same lines, was approved by the various Departments of the War Office, the Ministry of Munitions, and the Treasury, and a contract was finally made between the War Office and the Company in September, 1917. The Select Committee now reports that the scheme for erecting the factory in France has been abandoned. The factory at Dumfries has to some extent been dismantled, and £13,000 has been received from the War Office by the Company as an advance. The Committee regrets that a position should have been created which involves possible payments from public funds owing to the adoption and abandonment of this scheme. A new contract is now under consideration providing for the re-instatement of the factory at Dumfries, and for the production of 60,000 tons of briquettes a year, but in view of the enhanced cost of materials and of labour, the expenditure involved would be considerably more than that contemplated under the first scheme for the production of about an equal quantity.

Reported Discovery of Coal in Russia.—A new coalfield has been discovered in the Urals, near Bogolonsk, where the coal is obtained in open working by unskilled workers. It is stated that 400,000 to 560,000 tons will be available yearly, and that the Ministry of Railways has already laid down plans regarding this supply. The Government is greatly interested in this discovery, as hitherto the coal required in the Urals has had to be transported from Siberia, a distance of 2700 miles, requiring the use of 200 wagons per day, thus severely taxing the working capacity of the Siberian railways.—(*Z. angew. Chem.*, *Oct.* 23, 1917.)

Sugar Production in Austria.—According to the *Neue Freie Presse*, in the 1917 sugar season 350,000 metric tons of raw sugar was produced in Austria up to November 30. The total output is estimated at 530,000 metric tons, which is about 200,000 metric tons less than in 1916. It is hoped to maintain the present sugar ration, but no increase is possible. In Hungary the production in 1917 is estimated at 130,000 metric tons, as against 200,000 metric tons in 1916.—(*Bd. of Trade J.*, *Jan.* 10, 1917.)

Aluminium from Clay.—Germany has hitherto obtained from Southern France and Dalmatia the bauxite from which aluminium is produced (by the firm of Giulini in Ludwigshafen). It has now been officially stated in the Bavarian Upper House, says the *Münchener Neueste Nachrichten*, that the production of aluminium from native clay is to be undertaken.—(*Bd. of Trade J.*, *Jan.* 17, 1918.)

Future Use of French Munition Plants.—A communication from the French Chamber of Commerce states that the munition plants will be turned over to the dye-makers at the conclusion of the war. In the past three years France has succeeded in turning out large quantities of articles for home consumption, which before the war came from Germany, and which the French did not believe they could manufacture. By the use of the munition plants these articles are to be placed on the world's markets after the war at prices that will surprise foreigners. The Association Nationale d'Expansion Economique was founded on December 14, 1915, under the patronage of the Paris Chamber of Commerce. The Société d'Encouragement pour l'Industrie Nationale organised two exhibitions of French products as substitutes for foreign articles, one in June, 1916, and the other in June, 1917. At the last exhibition more than 100 firms were represented. The manufacture of pharmaceutical products and dyeing materials has largely benefited from the development of munition factories. Large works have been built in the suburbs of Paris, and in the neighbourhood of Lyons, St. Etienne, Roanne and Annonay for the preparation of acids, tar products, and explosives, and these will be easily transformed in peace time into works for chemical and pharmaceutical products. Many large and influential companies have been organised with a view to extending national production on these lines. By dividing between different firms the existing stocks of raw materials and the products left at the disposal of manufacturers by the military authorities, and by obtaining the demobilisation of indispensable chemists, the Office des Produits Chimiques et Pharmaceutiques formed in 1914, has re-opened many factories which were previously closed. The Syndicat des Matières Colorantes, formed during the summer of 1915, includes the principal firms concerned in chemical manufactures, mining, metallurgy, etc. The Compagnie Nationale des Matières Colorantes et Produits Chimiques, with a capital of 40,000,000 francs, has undertaken to supply home-made French products in place of those imported from Germany prior to the war. This firm has signed a contract with the Government with a view to utilising factories for explosives which have been built for the requirements of the war. On the conclusion of peace the company will be given possession by the State of a certain number of munition plants. On the other hand, the company is bound to assure the production of colouring matters and dyes, and to pay over to the Government a share of the profits stipulated in the contract.—(*Rev. d. Prod. Chim.*, *Nov.* 12, 1917.)

Chemical Industries at Marseilles.—The chemical factories in this district produce chiefly caustic soda and refined soda, sulphides, sulphate and carbonate of soda, chloride of lime, hydrochloric acid, carbon tetrachloride ("sulph'um.") and sulphide of copper. There are three large plants for manufacture of "sulphium" in the vicinity of the Etang de Berre, where the salt beds and the neighbouring lakes supply the chief raw material. Superphosphates of lime, nitric acid, tartaric acid, and alumina are also manufactured in several important establishments in this district. There are twelve sulphur refineries, mostly at Marseilles and Cette, with an aggregate consumption of about 100,000 tons of sulphur. Two of these refineries are owned by American capital, and in 1914 over 25,000 tons of sulphur were imported from Louisiana. The lack of shipping facilities and excessive freight rates reduced imports and production in 1916. The manufacture of ship paints is another prosperous Marseilles industry. Three of the leading sugar refineries in France are established in this city, two belonging to the same company. Their average output is about 146,000 metric tons annually, about two-thirds of which is usually exported, mainly to Morocco and other Mediterranean countries. These establishments worked to their full capacity during the past year. There are nine lime and cement factories in Marseilles and immediate vicinity, with an average production of 235,000 metric tons of cement and 135,000 metric tons of lime. Statistics of mining operations in this district during 1916 are not yet available. The average production of the coal mines in the Gard Department in the five years preceding the war was approximately 2,000,000 metric tons, and the Bouches-du-Rhone Department produced about 630,000 metric tons of lignite. It is reported that the total output of these mines last year was fairly satisfactory, but no figures are given. Definite data are also lacking concerning the bauxite mines in the Var and Herault Departments and the ochre mines in the Vancluse Department, but it is known that in both cases the output was materially reduced. The average production of bauxite in this district from 1910 to 1913, inclusive, was slightly in excess of 242,000 metric tons. The total bauxite production in France during 1913 was 309,294 metric tons. This industry was affected by labour shortage and an export embargo. The principal ochre mines are located at Apt (Vancluse), and in the immediate vicinity. These mines have been worked less actively than formerly, owing to the closing of the leading foreign markets—Germany, Austria-Hungary, and Russia.—(*U.S. Com. Rep.*)

PARLIAMENTARY NEWS.

The Non-Ferrous Metal (Industry) Bill.

This measure was considered in Committee of the House of Commons on January 15 and 16 last, amended and reported. Sir A. Stanley announced certain concessions which he was prepared to grant in order to meet some of the real criticisms that had been made. (1) The operation of the Act would be restricted to the United Kingdom. (2) The licence required would be granted for the whole period (5 years) of the Act instead of being renewable annually. (3) The expression "wholesale trader" would be defined by prescribing the minimum amounts of transactions which could be regarded as wholesale trading. (4) A schedule prescribing a new form of licence would be added to the Bill. (5) The licence fee would be one guinea. (6) Appeals would be heard in a Divisional Court of the King's Bench Division instead of in the High Court. (7) The onus of proof that a company was under enemy influence would be transferred to the Board of Trade. (8) To prevent evasions of the Act, the creation of subsidiary companies would be forbidden. (9) The powers of the Board of Trade to demand information would be confined to persons employed by or interested in the company.

Amendments to the Bill embodying substantially these alterations were duly passed, as was also a motion by Sir C. Henry, enabling those persons who are not in the metal trade, but have only casual dealings in metals, to deal without a licence. Mr. F. L. Brunner had put down a similar amendment in order to admit of chemical manufacturers selling scrap metal without a licence. In regard to (8), a new clause was inserted empowering companies to give notice to holders of bearer warrants to surrender them for cancellation and to receive registered shares in exchange. Another new clause added provides that no information as to any person or any business obtained under the Act should be published or disclosed without lawful authority, except for the purposes of legal proceedings under the Act. It was also agreed that the term "enemy State" should mean Germany, Austria, Hungary, Bulgaria, and Turkey; and that the word "capital" as applied to a company should include debentures, debenture stock, and money lent to the company.

In the discussion on an amendment (subsequently rejected) to refer the inexpediency of granting a licence to the decision of the Court, Mr. Brunner elicited from Sir A. Stanley the assurance that the Board of Trade was not a competitor in the metal business, nor had it any interest in the loan to buy mines in Canada or to erect new docks near Bristol.

Amendments to exclude copper and tin from the operation of the Act were rejected, and also a motion to annul its application to naturalised aliens.

When the Report stage came up for consideration on January 23, the Solicitor-General, in accordance with promises made in Committee moved amendments, to obviate the necessity of a licence when transactions were of an incidental kind, and to enlarge the grounds on which reference to the High Court might be demanded. These were agreed to, as was also another Government amendment providing that the penalty for infringement should be £100 for each day of the continuance of the offence. In moving an amendment (defeated) to omit the word "nickel" from the Bill, Mr. Pringle maintained that the British-America Nickel Corporation, to which the Government had lent assistance, was under enemy influence, and that this corporation had many shareholders in common with certain Norwegian companies which were controlled by a German company in Frankfort. A motion moved by Mr. Holt to exclude naturalised British subjects from the scope of the Act was declared by the Solicitor-General to be inconsistent with its purport; the Bill did not disqualify them but brought their cases under review. The motion was rejected and the Bill was read a third time, and passed.

Life of Patents.

The following written answer to Sir J. Harmood-Banner was supplied by Sir A. Stanley during the recess:—The Patents and Designs Bill does not contemplate the extension of one year's life to patents which have already had an extended term. Section 38 of the Principal Act is not repealed,

but only Subsection (4), which enacts that the insertion by a patentee in a contract of any condition voided by the Section shall be available for the defence in an action for infringement of the patent.

Utilisation of Waste Products.

In a written reply to Mr. Herbert Samuel, Mr. Bonar Law issued an account of the steps which had been taken to meet the recommendations made in the First Report of the Select Committee on National Expenditure. Among the results achieved in the utilisation of waste materials were the following:—Tallow to the value of about £900,000 per annum has been recovered; 1800 tons of glycerine have been produced at a cost of £59 10s. per ton, as compared with £300 per ton, the price of imported glycerine; over £1,000,000 worth of military rags and thousands of pounds worth of cuttings from cotton textiles have been recovered and utilised; and some hundreds of thousands of pounds worth of condemned boots have been sold for distribution among the working classes.—(Jan. 14.)

British-America Nickel Corporation.

In answer to questions put by Mr. Pringle asking for information concerning the advance made by the Government to the British-America Nickel Corporation (this J., 1918, 14 R), the President of the Board of Trade replied:—His Majesty's Government has not guaranteed the interest on any part of the share or loan capital of the British-America Nickel Corporation. The advance made to the Corporation by His Majesty's Government is secured by an issue of 3,000,000 dols. first mortgageg old bonds, forming part of an issue of 6,000,000 dols. first mortgage gold bonds, the whole issue ranking together. The trustee for the bondholders is the National Trust Company, Limited, a company incorporated in Canada, and not in New York, as stated by my hon. Friend. The advance is specifically allocated to purposes of development and the provision of working capital.

Answering a further question, the President said that he believed that the Government had security that the advance would be applied to purposes of development.—(Jan. 14.)

Another long question by the same member elicited the following reply from Mr. Wardle:—A certain amount of income debenture stock in the Corporation had been subscribed for in Canada by Norwegians, and the Government had not objected to this course as it was satisfied that no enemy interests were concerned. The Government had not undertaken to provide further capital or to guarantee interest on new capital created.—(Jan. 15.)

Answering another question on the same subject, Mr. Wardle intimated that the Corporation would reach the producing stage within two years, and consequently no arrangements for marketing the output had yet been made.—(Jan. 17.)

Petroleum Bill.

Replying to questions concerning the Petroleum (Production) Bill, Mr. Bonar Law said it had been decided not to proceed with it, as it had been found that the action necessary could be taken without special legislation.

Mr. Pringle: Are we to understand that the Government will be able to make arrangements for payment of royalties without legislation?

Mr. Bonar Law: No; but we have come to the conclusion that we can do what is necessary for the war.—(Jan. 14.)

Australian Zinc Concentrates.

Sir A. Stanley, in reply to a question put by Sir J. Harmood-Banner, intimated that arrangements had been made for the treatment of a quantity of Australian zinc concentrates at works to be erected at Avonmouth, and negotiations for the treatment of further quantities at Widnes, and possibly elsewhere, are in progress. No suggestion for treatment in Norway had been made.—(Jan. 14.)

Oil Supplies.

Dr. Addison, in a written reply to Mr. Ferens, referred to erroneous and misleading statements which had recently appeared in print. A full installation of a plant designed to distil 4000 gallons of oil from 100 tons of cannel would cost about £40,000. Although the average yield of oil would not exceed 25 gallons per ton of cannel, in some cases 40 gallons could be obtained. The production of 500,000,000 gallons of oil is quite impossible in present circumstances. It has not been found possible to accept in general the recommendations of the Report of the Petroleum Research Department, and a different scheme involving less labour, material, and money has been adopted.—(Jan. 16.)

Canal Traffic.

Sir A. Stanley, in reply to questions put by Col. Yate, said that it was not possible to state the proportion of coal and other heavy traffic which has been diverted to the canals so as to relieve the congestion on the railways. A considerable quantity of coal, grain and sugar has, however, been so diverted, and the amount of traffic conveyed over the controlled canals in November last was more than 1,700,000 tons. The number of boats on the canals which were idle has also been considerably reduced. It is not possible to state when they will be fully employed; it is entirely a question of man-power. —(*Jan.* 22.)

LEGAL INTELLIGENCE.

ACETONE DISTILLATION PLANT. *Blair, Campbell and McLean* v. *The Synthetic Products Co., Ltd.*

On December 18, 1917, before Mr. Justice Salter, in the King's Bench Division, Messrs. Blair, Campbell and McLean, of Govan, Glasgow, sued The Synthetic Products Co., of King's Lynn, Norfolk, for a balance of £1075 out of £2150, the contract price of a distillation plant. The defence was that the plant was inefficient, and a counterclaim was made for £107 for work done on the plant, £1000 for putting it right, and £7670 for damages for loss caused through it not being in proper condition for ten weeks. By the contract, signed between April 3 and 26, 1915, plaintiffs had to supply plant as specified capable of dealing with 50,000 gallons per day of potato mash containing acetone and butyl alcohol, and of delivering about 400 gals. per day of pure anhydrous acetone to Government specifications and 600 gals. per day of butyl alcohol. Defendants' works were taken over by the Government in March, 1916. Plaintiffs said the process was a secret one and that they could not be held responsible for the failure of the plant, which had been inspected and approved of by the Ministry of Munitions; the failure was due to the defendants' method of working. Evidence for the plaintiffs was continued on December 19, 20, and 21, when the case was adjourned until after the vacation.

The case was resumed on January 11, 1918, and continued on January 14, expert evidence for the defendants being given by the works manager at King's Lynn, and others. The further hearing was adjourned to a day in March after the return of his Lordship from circuit.

Alleged Infringement of Patents. *J. R. Hatmaker* v. *J. Nathan and Co.*

In the Court of Appeal on December 19, 1917, Lords Justices Swinfen Eady, Warrington, and Scrutton dismissed an appeal by J. R. Hatmaker, of New York, from a decision of Mr. Justice Astbury in an action by him against J. Nathan and Co. for an alleged infringement of patents for drying and preserving milk and milk products. The infringement alleged was the manufacture and sale of "Glaxo." Mr. Hatmaker, who argued the appeal in person, said that the gist of his patented process was the rapid evaporation of water from milk in a special drying machine. The dried milk came away from the machine in flakes, and these were reduced to powder. Lord Justice Swinfen Eady said that in his judgment the plaintiff's specification described a process which did not produce the result which the patentee claimed, and apparently Mr. Hatmaker became aware of it in 1908. The judgment of Mr. Justice Astbury was right. The other members of the Court concurred.

The Quality of Sodium Benzoate. *V. Picerno* v. *Biass Bros. and Co., Ltd.*

Mr. Justice Bailhache heard an action on January 18 by Vitantonio Picerno, trading as V. A. Picerno, of St. John's Hill, Clapham Junction, against Messrs. Biass Bros. and Co., Ltd., of Grange Road, Bermondsey, to recover the sum of £58 16s. the price of goods sold and delivered. Defendants admitted the claim, but counterclaimed for the same sum by way of damages, as they had to buy against the contract at a higher price. The onus of proof being on the defendants, they said that the counterclaim was in respect of 3 cwt. of sodium benzoate which they contracted to purchase at 19s. 6d. per lb. The sale was by sample, and their case was that the bulk was inferior to sample and numerchantable, and they purchased against contract at 23s. per lb. Mr. H. A. Law had analysed a sample in September, 1916, and found it to be pure, but in October he had found that a sample of the bulk was slightly acid; it contained boric acid and did not comply with the British Pharmacopœia standard. Mr. P. A. W. Self had also analysed a sample in July, 1916, and found it to be grossly adulterated, containing no less than 18·3 per cent. of boric acid. This was the case for the counterclaim. The plaintiff was a regular importer of sodium benzoate from Switzerland and America, and the material supplied to defendants was in a cask received from Switzerland and regarded as of B.P. standard. The sample sent to defendants was drawn from this cask. When the latter was subsequently returned by the defendants, an analysis by Mr. B. W. Hales showed that the contents consisted of 89·78 per cent. of sodium benzoate, 7·77 per cent. of boric acid, and 2·8 per cent. of moisture.

His Lordship held that the bulk was not up to the sample for some reason not apparent. Judgment would be for plaintiffs on the claim and for defendants on the counterclaim for £58 16s., with costs.

GOVERNMENT ORDERS AND NOTICES.

CALCIUM CARBIDE.

The wholesale price has been reduced to £35 per ton, as from January 1. This price is subject to alteration at any time by direction of the Minister of Munitions.

MATCHES.

The Matches Order No. 2, 1917, dated December 31 last, made by the Board of Trade, under the Defence of the Realm Regulations 2F and 2JJ, imposes new and amends old restrictions concerning wholesale and retail dealings in matches.

ASBESTOS.

An Order has been issued by the Lords Commissioners of the Admiralty, under date January 5, enacting that licences for sale must now be obtained from the Director of Materials and Priority, Admiralty, Great George Street, S.W. 1. The necessary returns of stocks, etc., must be kept.

DRUGS AND CHEMICALS (RETURNS) ORDER, 1918.

The Army Council notifies that all persons engaged in the manufacture or sale of drugs and chemicals of any description must furnish a return of their stocks when the amount held is larger than the quantity specified in the schedule, and/or when the quantity sold in 1917 was greater than the quantity therein specified. Returns are to include drugs in powder and in compressed form, but not in galenical preparations; different grades and varieties of each drug are to be calculated together.

LEAD ARSENATE.

The Food Production Department is informed by the Ministry of Munitions that fruit and other growers will not require a licence for the purchase of arsenate of lead for spraying purposes. They must, however, give the firms from which they buy lead arsenate: (1) An undertaking that all lead arsenate supplied to them will be used solely for the purpose of controlling insect pests, and (2) a statement of the nature and acreage of the crops which it is proposed to spray with lead arsenate.

STATUTORY LIST.

On Order in Council, dated January 11, amends the "Statutory List" of persons, etc., with whom trading is prohibited.

EXPORTS TO CHINA.

The Foreign Trade Department of the Foreign Office has notified various additions to and corrections in the list of persons, etc., to whom articles to be exported to China may be consigned.

MOTOR SPIRIT (CONSOLIDATION) AND GAS RESTRICTION ORDER, 1918.

The above new Order issued by the Board of Trade consolidates and amends the previous Order restricting the use of motor spirit and establishing a control over the use of gas for driving motor vehicles. The Order opens with a series of definitions which will assist both public and private users of motor vehicles to understand its effect. Owners of trade vehicles may obtain gas permits for purposes for which motor spirit licences would otherwise have been allotted, but a gas permit and a motor spirit licence will not be granted for the same vehicle, subject to this exception: that to every trade holding a gas permit a small quantity of motor spirit will be granted for emergency purposes, varying in

amount according to the size and power of the vehicle, but in no case exceeding four gallons a month. Gas permits will not confer upon the holder any right to demand a supply of Gas. There are at present no restrictions on the amount that may be used. Circumstances may arise in which it will be necessary for the Department to order that in areas where gas is plentiful and readily available it should be used as a substitute for motor spirit.

EXPORTS TO THE UNITED STATES.

The Director of the War Trade Department announces that, by arrangement with the United States Authorities, licences for future exports to the United States of the commodities specified in Column A (below) will be drawn for consignment to the Association specified in Column B (below) against whose name the commodity in question is placed.

Bills of Lading must accordingly be drawn for consignment to the appropriate Association, and no other name must appear in the body of the Bill of Lading. The Bill of Lading should, however, contain a *marginal* clause reading:—

Notify
A. B. (here state name of consignees).

Column A.	Column B.
Wool, jute, flax and semi-manufactured products thereof; animal hair of all kinds, and tops, noils and yarns thereof; woolled and haired skins; Indian and Egyptian cotton; and mica.	Textile Alliance Incorporated, New York.
Rubber, including guttajoolatong, guttapercha, balata, guttasiak, scrap and reclaimed rubber, and all rubber substitutes.	The Rubber Association of America, Inc., New York.
Plumbago	Plumbago and Graphite Association, Inc., New York.
Tin, chloride of tin and tin ore	American Iron and Steel Institute, New York.
Leather, hides and skins (other than woolled or haired skins), and tanning materials.	Tanners' Council of America.
Shellac and lacs of all kinds..	United States Shellac Importers Association, Inc., New York.

HIDES (RESTRICTION OF TANNING) ORDER, 1918.

The Secretary of the War Office notifies (January 11) that after February 2 no hides can be put into process without a permit issued by the Director of Raw Materials, War Office. This permit indicates in detail the classes and weights of hides the input of which by sole leather tanners is prohibited, and any tanner who has not received a permit should apply immediately to the Director of Raw Materials (R.M. 2.d.), Imperial House, Tothill Street, London, S.W.1.

NITRATE OF SODA EXECUTIVE.

This Executive has been formed to deal with the purchase and supply of sodium nitrate in Chili for the British, French, Italian and United States Governments. All questions concerned with the purchase, sale and shipment of nitrate of soda, the supply of fuel, bags, machinery, etc., should be addressed to the Secretary at Empire House, Kingsway, London, W.C.2.

FLAX CULTIVATION.

A special branch of the Flax Control Board, to be called the Flax Production Branch, has been appointed temporarily to assist in making arrangements for the extension of flax cultivation during 1918, and for dealing with the crop. The Board will also be assisted by a Committee, with Mr. Alfred Wood as Secretary. [Address: 14, Victoria Street, London, S.W.1.]

REPORTS.

ELECTRIC POWER SUPPLY IN GREAT BRITAIN.

Abstract of the Interim Report of the Coal Conservation Sub-Committee of the Reconstruction Committee, Ministry of Reconstruction [Cd. 8880, 3d.]. 28 pages. 1917.

It is estimated that 80 million tons of coal are consumed annually in the production of motive power in Great Britain. The magnitude of this figure together with the fact that the available supplies are not unlimited, and that year by year the winning of the coal gets more difficult and therefore more expensive, makes it imperative that coal used for power purposes should be economised. At the termination of hostilities the demand for power must increase (1) by reason of the introduction of new industries; (2) by the adoption of more mechanical devices in all industries. This latter is very important as it is really the only means of increasing the earning capacity of the workers. It is pointed out that in America the amount of power used per worker is probably double that of this country, the result being not only higher wages but better living conditions. It may therefore be assumed that future progress will be made not by reducing the total coal consumption but by increasing the industrial output for a given coal consumption. During the last 25 years the coal consumption per horse power hour has been halved and by economical use the present consumption of coal should produce at least three times as much power.

That the electric motor is the most economical method of applying power to industry has been proved conclusively during the last decade, and more particularly during the recent enormous extension of munition manufacture. The problem under review is now reduced to one of the economical production and distribution of electric power, and since in this country we have no large supplies of water power, natural oil or gas, our only large source of power is coal.

There are two alternative methods of electric power production, the first that in which each user has his own generating plant, the second that in which one large power station supplies a large group of consumers. A comparison of these two methods shows the central or collective scheme to be superior in every respect. A large plant installed on a suitable site with convenient transport and water supply, will have better supervision, lower capital charges, and more economical production than a number of small plants built in inconvenient and often congested areas.

Furthermore a central station supplying power at a cheap rate will increase the demand and so increase the load and get a still better efficiency, while in the case of small undertakings, the selling price being high, manufacturers often find it cheaper to instal plants of their own, thus spreading the inefficient system of individual production. A very clear instance of the two systems is given by a comparison of the industrial districts of Lancashire and of the N.E. Coast. Lancashire has the advantage of large size and compactness, being probably the largest and most intensely industrial district in the world, but the electric upply is in the hands of some 23 undertakings

and the selling prices, varying from 0·66d. to 2·42d. per unit, average at 1·32d. In the North-East, the district is larger in actual area but much more thinly populated and therefore at a disadvantage, but the supply being from one system the price is less than 0.5d. per unit.

With a few exceptions, the electric supply of the country at present is entirely on the individual scheme (there being some 600 different stations) and must therefore be uneconomical and unsatisfactory. When looking forward to future developments one finds that the present scheme will become still more difficult, in so far as many of the stations are in congested areas where extensions are difficult and water supplies poor.

A comprehensive scheme of electricity supply if inaugurated will save fifty-five million tons of coal or in money value over twenty-seven million pounds; or alternatively the coal saved will produce a further 15,000,000 horse power continuously throughout the year. Reckoning the indirect gains, the total saving per year is computed at about £100,000,000.

The present Power Acts have had unsatisfactory results, and in many cases have enabled local lighting authorities to obstruct the development of power companies. The Committee recommends:—

That a comprehensive scheme be inaugurated, consisting of 16 central stations. one to each of the 16 districts into which Great Britain is to be divided.

That the sites for stations be chosen at once, the chief criteria in choosing the sites being:—transport facilities, water supply, and ample room for extensions.

That plans be drawn up for the construction of these super-power plants so that the erection can be commenced directly after the war. The size of the generating units to be not less than 20,000 horse power, giving 3-phase alternating current.

That surplus gas, waste heat, and waste coal should be converted into electrical energy in the locality of their occurrence and the energy fed into the main trunk system.

That a Board of Electricity Commissioners be appointed to deal fully with the electricity supply throughout the country and carry out the policy advocated by:—

(A) Stopping the extension of the present inefficient methods.

(B) Arranging for the handing over of the present plants and systems to the new electrical Body appointed in each area.

(C) Standardising the voltage and frequency in each area.

(D) Settling whether the control shall be in the hands of a municipal authority or of a Parliamentary company.

A. R. R.

THE MANCHESTER STEAM USERS' ASSOCIATION.

MEMORANDUM FOR 1916—17 BY C. E. STROMEYER, CHIEF ENGINEER.

Steam boiler efficiency is dependent on the losses which occur in the transference of energy from the fuel to the water. Certain of these losses, such as those due to radiation and combustible matter in the clinker, are unavoidable and fairly constant in quantity, whereas loss of heat to the chimney is a factor dependent on the integrity and skill of the stoker. This is especially the case with hand-fired boilers. As a rule these are fired once every quarter of an hour, and the operation lasts about two minutes. An inexperienced or careless stoker may increase this period to four or even six minutes, and thereby increase the loss by 10 to 15 per cent. Under present conditions where the quality of fuel may be low and varied, and where a large output is demanded, time can be profitably spent in instructing the stokers in the methods which will give the best results.

The author analyses in considerable detail the Board of Trade reports on boiler explosions caused by corrosion, and deduces an important conclusion from them, viz., that when wrought iron plates are materially reduced in thickness by corrosion, their tenacity is reduced to about one-third of its original value. The wastage which brought about these explosions would have been detected by an experienced boiler inspector employing the hammer test.

A study has been made of the action of caustic liquors on steel plates, which has bearing not only on boiler practice, but also on the technique of heating caustic liquors in autoclaves. The embrittling action of caustic liquors is shown to occur only when the steel is in tension. The maintenance of the samples in a state of tension during treatment was partially achieved by cutting pairs of rings out of the solid plate—one ring with a tapered inner edge, and the other with a tapered outer edge, and driving the one ring over the other, thus placing the outer in a state of tension, and the inner in a state of compression. Samples were exposed in a caustic evaporator for four months and then examined and compared with untreated samples by cutting them up into small segments and bending one piece from each ring outwards and another piece inwards. Cracks appeared in innumerable places only on the two samples (annealed and unannealed before stressing) which were in tension while exposed to the caustic liquor. These cracks appeared both on the outer surface, which was in direct contact with the caustic liquor, and on the inner surface which was not in contact with the caustic liquor, but was pressing hard against the compressed inner ring. Evidently, therefore, the influence of the caustic liquor had penetrated through a quarter of an inch of metal. Further, the treated rings fell apart quite easily, showing that nearly all the spring had gone out of the metal, the strained condition being lost.

Exposure of bars of open-hearth steel both acid and basic, Bessemer steel, and wrought iron, to caustic solutions of various strengths in autoclaves under pressure, produced a very marked hardening effect.

The experiments show that to be of value the test samples must be in a state of tension such as obtains in boiler and autoclave shells, a condition not easy of attainment. Reference is made to the work of Heyn and of Parr (University of Illinois, Bulletin No. 94), and it is suggested that they failed to obtain this condition.

The conclusion, which is supported by the work of Dr. Wolff in a recent communication to the Iron and Steel Institute, is that there is a strong suspicion, although no actual proof, that caustic soda in boilers leads to dangerous embrittlement of the plates. This may be found as cracks leading away from rivet holes, and in the breaking away of rivet heads. It should be remembered that sodium carbonate is gradually converted into caustic soda under high pressure boiler conditions.

The strength and tightness of cover joints of autoclaves are also discussed. In cases where a lid which is nearly flat is bolted to a flanged cylindrical body, the internal pressure bulges the lid and causes barrelling of the body, tending to open the joint as far as the bolts, and no manner of packing or grooving can be satisfactory. To overcome this the lid should be a flanged dome of a certain height which will not expand along with the cylindrical portion, the result being that internal pressure will cause a tightening of the

joint at the inner edges. In such a construction the bolts must be strong, *e.g.*, for a pressure of 800 lb. per sq. in. and a 24-in. cylinder, the minimum bolt diameter would have to be at least $2\frac{5}{8}$ inches.

For certain operations autoclaves may be replaced by a long pipe coiled into suitable vessels for maintaining the correct temperature. The liquids to be treated are pumped into this pipe in the proper proportion, pressure being maintained by a loaded relief valve at the outlet end. The diameter of the tube should be sufficiently small to ensure a thorough mixing. Hitherto iron pipes have been used, but weaker metals are possible, provided a similar pressure is applied by means of the heating bath to the outside of the pipe.

B. G. McL.

TRADE NOTES.

THE NEW TRADE MARKS AND DESIGNS BILL.

A Bill to amend the Trade Marks Act, 1905, has recently passed its first reading in the House of Commons and been printed.

According to this new Bill, it is proposed to divide the register of trade marks into two parts, A and B.

Part A of the register will comprise all trade marks entered on the register of trade marks under the provisions of the Act of 1905, and all trade marks which, after the commencement of the new measure, are granted registration under the principal Act.

Part B will comprise all trade marks specially registered under the new measure. Persons not infrequently work up a large trade in connection with a trade mark, and then find they cannot register it. Part B is designed to remedy this defect, and enable any person who has (for a period of not less than three years) *bona fide* used a mark for the purpose of distinguishing his goods from goods of other persons, to enter that mark on the register in Part B in respect of such goods, subject, of course, to the mark not having been previously registered by some one else. Thus, a mark such as "Sunsweet" for canned fruits, which would not be registrable in Part A because it is descriptive of fruit brought to perfection or sweetened by the warm rays of the sun, would be registrable in part B, provided it has been used by its owner for three years, and provided it distinguishes his goods from other traders. It will be seen, therefore, that the general principle underlying part B is good. All persons who are granted a registration in part B must indicate the fact in their advertisements, that such registration is in part B.

The other important provision in the new Bill is to be found in Section 7, Sub-sections 1 and 2, and this is causing a large amount of discussion and, in some quarters, unfavourable comment. This section provides that if the proprietor of a word trade mark so uses or advertises his mark as to lead the public to regard it as the name of the article, then in that case it shall be removed from the register. This is subject to the proviso that if it be proved that since the passing of the Act the owner has taken all reasonable steps to prevent such improper use, the Court may, subject to conditions, remove the mark into Part B. This holds good even in cases of trade marks already on the register for many years.

The object and aim of a trade mark is not to protect the name of the goods themselves, but to distinguish between one man's goods and another man's goods. The phrase, "Take a Kodak with you for the holidays" is constantly seen, and if this new Trade Mark Bill becomes law, it will have to be altered to "Take a camera, Kodak Brand, with you for the holidays," so as to make it clear that "camera" is the name of the goods, and "Kodak" the distinguishing trade mark for those goods.

Many instances can be recalled of marks which have become the names of articles, and in many cases this Bill (if it becomes law) will probably result in great hardship. Chambers of Commerce will have to consider carefully whether this clause in the new measure will be prejudicial to traders.

W. P. T.

Board of Trade Returns.—The imports into the United Kingdom during 1917 were valued at £1,065,256,407, and the exports at £525,308,991, the former showing a gain of 12·3 per cent. and the latter a gain of 3·8 per cent. over the corresponding values for 1916. The net excess of imports over exports increased by 34·5 per cent. during the same period. During the past year the materials classified under chemicals, drugs, dyes, etc., were imported to the value of £28,040,438, about £600,000 less than in 1916; and the value of the exports was £23,667,485, or nearly £4,000,000 below the figure for the previous year. It is not possible to draw any reliable conclusions from such comparative data because, among other reasons, the returns for 1917 include items imported by the Government over a period of six months, which were not included in 1916; values generally have been much increased by rise in prices; and trade has been affected by the many restrictions on exports.

FOREIGN.

The Second Sample Fair at Bordeaux.—A leading source of wealth in the neighbourhood of Bordeaux, and one to which considerable time, attention, and capital have been devoted, is the resin industry of the Department of the Landes, a part of south-western France which lies along the coast between the Gironde and the Pyrenees. The extensive forests of maritime pines yield unlimited quantities of resin, which is refined for turpentine, for use in making pitch, in the shipbuilding industry of the ports in the district, in making briquettes of sawdust, and in the manufacture of munitions. There were twenty-six displays of the products of this region at the Fair. Industrial and pharmaceutical products were also displayed in this section. Particular attention was given to those used in viticulture and horticulture—copper sulphate, lead arsenate, sulphur, lime, phosphates and other products.—(*U.S. Com. Rept.*)

Sheep Dip in Tasmania.—Tasmania uses a great deal of sheep dip from England, but an American preparation based on the 8-18-10 formula is achieving popularity. It consists of 8 lb. of high-grade commercial quicklime, 18 lb. fine sulphur flowers, and a little more than 15 gallons of water and the whole boiled down to 10 gallons in about one hour.—(*Merc. Guardn., Dec.* 21, 1917.)

* * *

Various chemicals and machinery are in demand at Singapore for use in the rubber industry. The former include: zinc oxide, lead oxide, soda, magnesium carbonate, and flowers of sulphur.

It is expected that there will soon be some compulsory change in the sale of drugs and medicines in India. In view of the many difficulties in obtaining supplies from other countries the Government will probably decide to manufacture the whole list of drugs and medicines now in

demand, and it is understood that the Surgeon-General has advocated in a memorandum to the Government the cultivation of a large number of medicinal plants. Castor oil will in future be manufactured in the country.

There is a good demand at Pernambuco, Brazil, for dyes suitable for the cotton textile industry, and also for chemicals such as caustic soda, soda ash and acetic acid.

German manufacturers of certain chemicals, such as tartar, rosin and glycerine, have sent circulars to importers of chemicals in Malaga (Spain), stating that "the resumption of commercial activity is expected to take place early in 1918," and asking the recipients of such letters to reserve their orders, etc.

A series of new cottonseed oil-refining establishments are planned for erection in Russia during 1918, as it is hoped that the industry will be greatly developed to cope with the enormous demands after the war. Two new mills were recently erected at Ferghana and Murgal. It is difficult to estimate the value of the cottonseed export during the last two years; but before the war some 20,000—25,000 tons were exported from Turkestan. From this cottonseed an average yield of 6·50 lbs. of unrefined oil is calculated per pood, besides 14 lb. of oilcake and 20 lb. of husks.—(*Kelly's Month. Tr. Rev., Jan.* 1918.)

* * *

New Foreign Companies, etc. At the instigation of the French Ministry of Munitions a new company "Minérais et Métaux" has been formed with a capital of 10,000,000 frs., in which the whole of the lead trade is to be concentrated.

The "Soc. An. des Ciments du Pays" (Turkish Cement Co.) has been formed at Constantinople with a capital of 60,000 Turkish pounds (18s. 0¾d.) with powers to establish branches in Turkey and abroad.

Joenköpings & Vulkans Match Works A.G., of Joenköping, has increased its capital by 3,000,000 kr. to 16,500,000 kr. The new stock will be distributed to the old shareholders as free shares. (Dividend for 1916, 12%.) This firm is amalgamating at the end of the year with the Association of Swedish Match Manufacturers (Förenade Svenska Tändstiks-Aktiebolaget, Stockholm, Gothenburg, Malmö and Värjö) to form a company with a minimum capital of 40,000,000 kr. This combine will be the largest of its kind and will have works in Sweden, Norway, Finland, Russia and England. The Swedish works alone, about 13 in number, employ 9000 workers.

The Union Bank, in conjunction with the Saccharin-fabrik A.-G., vorm. Fahlberg, List & Co., of Magdeburg, has been granted permission to establish the Oderberger Chemische Werke with a capital of 4,000,000 kr.

The Spalato-Zementfabrik has increased its capital from 6,000,000 to 10,000,000 kr.

The Ungarisch-Belgische Metallurgische Fabrik A.-G. has increased its capital from 2,000,000 to 4,000,000 kr., by an issue of 10,000 shares.—(*Z. angew. Chem., Nov.* 6, 1917.)

South African Diamonds.—The total output of diamonds in the Union of South Africa during the six months ended June 30 last was 1,432,435 carats valued at £3,814,344, of which the Transvaal produced about 34 per cent., the Cape 56 per cent., and the Orange River Colony about 10 per cent. The total production for 1916 was 2,346,330 carats, valued at £5,728,301.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal.)

OPENINGS FOR BRITISH TRADE.

Application has been received at the Board of Trade (Development and Intelligence Dept.) for the names of manufacturers in a position to supply Ultramarine Blue.

TARIFF CUSTOMS AND EXCISE.

Canada. Licences are now required for the exportation of: Oils, fats, oilseeds and oilnuts (including copra), fertilisers, oilcake and meal, glucose, glycerine, grease of animal or vegetable origin, lard, lard compounds, lard substitutes, including "Criscoe," malt, molasses, oleomargarine, soap, soap powder, stearic acid, stearic acid candles, stearine, sugar, sugar of milk, starch, syrup, tallow and tallow candles.

Additional Regulations have been issued concerning the importation, manufacture and sale of oleomargarine.

Nigeria. The following export duties take effect from January 1, 1918:—Groundnuts, 10s. per ton; hides and skins, untanned or haired, 2d. per lb., tanned, 3d. per lb.

Sierra Leone. The following export duties have been proposed, to come into operation on January 1, 1918:—Palm kernels, 10s. per ton, palm oil, 10s. 5d. per ton, kola nuts, 1s. 8d. per cwt.

United States. A circular of the United States Treasury Dept., dated November 12, 1917, contains an opinion expressed by the Attorney-General (U.S.A.) upon the interpretation of the Food Control Act of August 10, 1917, and the War Revenue Act of October 3, 1917, relating to the prohibition of the importation of distilled spirits into the U.S.A. (For summary, see Bd. of Trade J., Jan. 10, 1918.)

Numerous additions have been made (November 28, 1917) to the list of prohibited exports, which now includes: Antimony, antimony ore, asbestos, balata, mica, mica splittings, strontium ores, titanium, wolframite, and iridium; arsenic and its compounds, opium, caustic soda, soda ash, methylethyl ketone and wood alcohol; acetic acid, glacial acetic acid, acetate of cellulose and all acetates; animal oils and vegetable oils; beans, eggs, peanut meal, flaxseed, soya bean meal, soya bean oil, starch, rubber sponges, gutta joolatong, gutta percha, gutta siak, shellac, seedlac, and cinchona bark.

Regulations have been issued by the Commissioner of Internal Revenue concerning the increase of the tax on distilled spirits by the Act of October 3, 1917, and the additional tax imposed by the same Act (Section 300).

France. A French Presidential Decree prohibits, as from December 31 last, the exportation and re-exportation from France of the scales of the ablet (*ablette*) or other fish, and of the essence called "Orient" extracted from these scales.

France (New Caledonia). An export tax of 3% *ad valorem* on ores produced in New Caledonia and its Dependencies, and a 4% *ad val.* export tax on products of the treatment of these ores, have been levied by a Presidential Decree of December 23 last.

Norway. The exportation of ammunition and explosives of all kinds, and wax of all kinds, is now prohibited.

BOOK REVIEW.

Cotton and other Vegetable Fibres; Their Production and Utilisation. *By E. Goulding, D.Sc. (John Murray, 1917.) Pp. 231. Price 6s. net.*

This volume is issued in the Imperial Institute Series of Handbooks on the Commercial Resources of the Tropics, under the general editorship of Professor Wyndham R. Dunstan. Its object is to supply collected information calculated to encourage the development of fibre cultivation in the British Empire, and as the Head of the Fibre Section of the Imperial Institute, the author has had the advantage of direct access to the reports and statistics from the Overseas sources where active development is being carried on. It is not to be expected that any single individual should be a scientific or commercial authority on all the multitudinous fibres that find their way to the London market from all quarters of the earth, and at the same time should be in a position to speak with first-hand practical experience as a tropical planter. Consequently, the book is necessarily compiled from data, published and unpublished, of very diffuse origin, some of which may be more reliable than others. It is therefore to be regretted that the author has been so sparing in his references.

Even in matters which must have come under the author's personal observation, there is here and there evidence of loose writing which may inspire distrust of the accuracy of statements relating to less familiar subjects. One of the most glaring instances occurs on page 219, with reference to Esparto Grass. This grass must have been handled in the fibre department of the Imperial Institute time after time, as it is used as a standard of comparison for all new paper-making fibres; yet it is here described as a "cylindrical wiry stem," whereas it is very obviously neither a stem nor cylindrical but an ordinary grass leaf tightly folded on its longitudinal axis.

From the above remarks it must not be inferred that the book is not both interesting and valuable. The arrangement and treatment of the subject are well proportioned and systematic, only the type of matter offered is rather for the instruction and information of the seriously-minded general public than for the particular guidiance of the industrial or agricultural specialist.

After a brief description of the methods employed for the examination of fibres and their classification, a chapter is devoted to the natural history of the cotton plant and its agricultural and industrial treatment from the selection of the ground to the baling of the finished product. The section on cotton occupies about 90 pages, and this section, as well as succeeding ones on other fibres, is divided into headings dealing respectively with climate, soil, cultivation, harvesting, yield, industrial preparation, uses, diseases, and pests. The subject proper is in all cases followed by an account of the experiments, successful and otherwise, undertaken with a view to widening the field of production within the British Empire. The section on flax cultivation and retting should prove of particular interest at the present moment in view of the attempts now being made to resuscitate flax-growing in Scotland as a war-crop. The author (page 112) considerably underestimates the maximum length of the ultimate flax fibre at 1·5 in.; as a matter of fact a first-class flax will run regularly at 2 ins. or over. Again, the statement (page 121) that hemp cannot be bleached satisfactorily is hardly in accordance with the facts; being used chiefly for coarse textiles, it is not often required in the bleached condition, but it can be bleached as easily as flax and by similar methods. The section on jute is illustrated by two very good botanical plates showing the habit of the two principal varieties of the plant. Attempts at jute cultivation, outside India, have not given very satisfactory results, and even in India, outside Bengal, the industry is of little importance; it is reassuring to learn from the preface, however, that India is probably quite capable of meeting the increased demand for jute in the near future. The section on jute substitutes is interesting because it is probably not possible to find such collected information elsewhere. Among the cordage fibres the section dealing with Sisal hemp attracts attention, and it would appear that the production of this fibre is destined to find an important place in the development of our African dependencies, particularly in East Africa. One of the most interesting fibres of this group is Phormium or New Zealand flax, the popularity of which is bound to increase as the efforts of the Government to improve the extraction processes begin to bear fruit. It is gratifying to note that the production of this fibre has been successfully established in St. Helena, and is being tried also in Scotland. Among the descriptions of miscellaneous fibres, the sections on coir and kapok are good and worthy of note.

J. F. Briggs.

PUBLICATIONS RECEIVED.

Cotton and Other Vegetable Fibres. *By* E. Goulding. *Imperial Institute Handbook. Pp. 231. (London: J. Murray.)*

A Text-Book of Inorganic Chemistry. *By* Prof. A. F. Holleman. *Issued in English in co-operation with* H. C. Cooper. *New Edition. Pp. 507. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.)*

A Text-Book of Inorganic Chemistry. *Edited by* Dr. J. N. Friend. *Vol iv., Aluminium and its Congeners, including the Rare Earth Metals. By* H. F. V. Little *Pp. 485. (London: C. Griffin and Co.)*

The Book of Rothamsted Experiments. *By* Sir A. D. Hall. *Second Edition, by* Dr. E. J. Russell. *(London: J. Murray.)*

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

CHARACTERISTICS OF GOOD NITROGENOUS FERTILISERS.

E. J. RUSSELL.

The recognition by chemists of the vital necessity of combined nitrogen for the purpose of waging war has directed attention to the equally vital necessity of combined nitrogen for the purpose of agriculture. Prior to the war this country alone consumed something like 225,000 tons per annum of manufactured nitrogenous manures, containing probably some 30,000 tons or more of combined nitrogen. One of the few things of which we may be reasonably certain is that after the war there will be a great demand for combined nitrogen for agriculture, and judging from the number of inquiries addressed to the Rothamsted Experimental Station on the subject, chemists are fully alive to the possibilities of the situation.

If any stimulus were wanted, it could be found in the persistent rising of the prices of nitrogenous fertilisers during the past ten years, and still more from an appreciation of the large amount of food stuffs that can be obtained by the intelligent application of these fertilisers. Careful measurements have shown that the application to an acre of land of 1 cwt. of nitrate of soda or sulphate of ammonia, or 1½ cwt. of nitrolim, under proper conditions and within certain limits, may reasonably be expected to give the following crop increases :—

	Crop increase.		Present market value of increase.	This increase produces: Calories in millions available for human use.	No. of days for which these heat units will last one man.
Potatoes	1 ton		£6 0	0·96	280
	grain.	straw.			
Wheat	4½ bushels	5 cwt.	£2 5	0·36	100
Barley	6½ ,,	6¼ ,,	£2 10	0·36	100
Oats.....................	7 ,,	6 ,,	£2 10	0·32	94

Soil also contains numerous bacteria, capable of rapidly converting protein, amino-acids, and many amides into ammonia, which is then oxidised to nitrate: in consequence protein nitrogen, amino-acid nitrogen, and amide nitrogen are all of great manurial value.

Calcium cyanamide (nitrolim) is almost quantitatively converted into ammonia in the soil and thence into nitrate: thus it is also of high manurial value. If the effectiveness of nitric nitrogen is put at 100, ammoniacal nitrogen would be about 95, cyanamide nitrogen about 85 to 90 or more, and protein nitrogen about 70 to 80.

No other combination of nitrogen so far tested is known to have as high manurial value as these substances: plants cannot absorb them as such, and the soil bacteria cannot convert them into ammonia. Thus neither the nitro bodies nor the diazo-compounds, nor the ring compounds resistant to bacterial action in the soil are, so far as is known, of any fertilising value. If it were proposed to utilise any of them as fertilisers it would be necessary first to decompose them and bring them into a form in which they would be convertible into nitrates in the soil.

Besides this requirement that the nitrogen should be convertible into ammonia or nitrate in the soil, there is a second requirement that is equally indispensable. The other constituents should be innocuous to plant and bacterial life; if they are beneficial, so much the better. Plants growing in natural soil are not over sensitive, and the soil

One cwt. of these concentrated fertilisers is therefore capable of producing enough food to satisfy a man's bodily requirements for 100 or more days, or, in other words, one pound of combined nitrogen properly used in the soil will yield enough food to keep a man going for about five days. No apology is needed, therefore, for emphasising the desirability of increasing supplies of combined nitrogen.

I propose in the present paper to set out the properties that the farmer expects in a good nitrogenous fertiliser, with the view of assisting the works chemist in deciding whether any particular nitrogen compound or nitrogenous material can be usefully made into a fertiliser.

The normal course of events is for the plant to take up practically the whole of its nitrogen in the form of nitrate: in consequence, the most effective fertilisers are the nitrates of sodium, potassium, ammonium, and calcium. For some of these there has long been a considerable demand, which is likely to be increased if post-war conditions are such that farmers are able to increase their areas of ploughed land and grow more corn.

Other nitrogen compounds are effective in so far as they can be converted into nitrates in the soil. Ammonium salts come a very close second to the nitrates, since ammonia is rapidly converted into nitrate in the soil by bacterial action, and the process is complete before the plant really needs all the nitrogen that has been applied.

organisms, if given time, will oxidise many toxic substances; for example, phenol and cresol disappear tolerably rapidly from soil, being oxidised by some of the organisms occurring therein. But there are some groupings that living plants will not tolerate, and if these are present the material cannot safely be used as manure. The simplest test for these harmful substances is the plant itself. At Rothamsted the test is carried out as follows:—Twelve pots are filled with garden or field soil, and then divided into three sets of four each. In one set the substance to be tested is incorporated in the soil at the rate of 100 mgms. of nitrogen per kilo. of soil: the second set is similarly treated with sodium nitrate also at the rate of 100 mgms. per kilo. of soil: the third set is left untreated. Seeds of wheat, barley, or mustard are sown according to the season (wheat in winter, barley in spring, and mustard in summer or autumn), and the pots kept equally moistened. The plant rapidly and definitely indicates the fertilising value of the material used, and the presence or absence of toxins. In the latter case, not only is growth depressed below that of the untreated plants, but the young leaves show some abnormal features: the edges or tips may be bleached or withered, or the leaves may be very dark green in colour and curl under, or be otherwise affected. If a toxin is indicated the chemist must find some way of decomposing it.

In studying fertilisers at Rothamsted this test

is never omitted. A substance was recently investigated which, from its analysis, seemed most promising as a fertiliser: it was rich in nitrogen, mainly in nitrate form, as the result of previous special treatment. But as soon as it was tried in the pot experiment the young plants were poisoned: the seed leaves became blanched at the edges, and though the seedlings struggled into plants which finally attained maturity, growth was considerably behind that of the untreated soil, and the proposed fertiliser had done more harm than good.

Turning now to the nitrates and ammonium salts, which are known to possess high fertilising value, there are two standard fertilisers with which the farmer is familiar, and which in peace time he can obtain in considerable quantities—nitrate of soda and sulphate of ammonia. Any proposed new fertiliser would have to meet the competition of these, and would therefore need to possess some advantage of cheapness, greater effectiveness or convenience, if it hoped to come into use.

Potassium nitrate has the advantage that it contains potassium which itself is of considerable fertilising value: the farmer, therefore, has two manures in one substance. It so happens that potassium is not very widely needed in this country for farm crops, the need being usually restricted to potatoes, mangolds, and clover. Of these, clover does not want added nitrogen, and the potato is rarely supplied with nitrate by the best growers, who consider that it thereby loses in quality: it is instead given ammoniacal nitrogen. The mangold is the only crop requiring both potassium and nitric nitrogen, but it so happens that it needs sodium and chlorine as well, so that nitrate of soda and kainit forms a good combination for the purpose. The farmer is, therefore, not specially drawn to potassium nitrate, and is never prepared to pay a high price for it, certainly not the price that was asked before the war. There is some demand by horticulturists but not much; there may also be the possibility of working up an export trade.

Calcium nitrate has far greater possibilities as a fertiliser, because it is said to be producible at a price enabling it to compete with nitrate of soda. The calcium is somewhat more useful in the soil than the sodium, but, on the other hand, this advantage is offset by the fact that calcium nitrate readily deliquesces, and therefore is not easily stored or handled by the farmer. This can to some extent be overcome by making a basic nitrate, but the percentage of nitrogen then becomes lowered, and the farmer has to pay more per unit of nitrogen for freight, cartage, drilling, and handling than in the case of nitrate of soda with its higher nitrogen content. Probably these disadvantages rather more than counterbalance the advantage of the calcium so that the price of the nitrogen should be somewhat less.

Ammonium nitrate has the advantage that it is very rich in nitrogen, and therefore bagging, freight, and transport charges per unit are reduced to a minimum. This is of obvious importance in the home trade, and to a still greater extent in certain branches of the export trade. Unfortunately the advantage is somewhat discounted by the circumstance that ammonium nitrate is deliquescent, and therefore not easily applied to the land by means of the ordinary manure drill. Further, it is so extremely soluble that it plasmolyses the leaves of the young crop to which it is applied. In some of the experiments hitherto made it has not proved equal to nitrate of soda or nitrate of lime (see this J., 1917, 250); however, it is not to be supposed that the last word has been said on the subject.

Three ammonium salts have been used as fertilisers in addition to the ordinary sulphate. The muriate has been extensively tested and found to be indistinguishable from the sulphate in fertilising action (the basis being equal amounts of nitrogen). If it had any advantage over the sulphate to the works chemist it could be used extensively as a fertiliser.

The old sesqui-carbonate of ammonia was tested some 50 or 60 years ago at Rothamsted, but the results were not very satisfactory. The losses of ammonia seem to have been considerable, and in consequence the return per unit of nitrogen was less than when the sulphate was used. It is possible that the normal carbonate which could be made nowadays would be less liable to loss, and therefore more effective as a fertiliser.

Ammonium phosphate, like potassium nitrate, has the advantage of supplying two fertilisers in one article, and thus of saving freight, cartage, bags, etc., always a great consideration in the export trade, and not without significance at home. There is, however, nothing to show that it is more effective as a fertiliser than a mixture of sulphate of ammonia and superphosphate, and the farmer would not be willing to pay a higher price. Last autumn sulphate of ammonia was being sold for £15 15s. per ton, and 30% super (*ie.*, superphosphate, containing water soluble phosphate equivalent to 30% $Ca_3P_2O_8$), at £6 10s. per ton: at present the prices are higher. It is easy, therefore, to calculate what any given sample of ammonium phosphate would be worth in the home market. For the export trade a higher price relatively to the mixture of sulphate and super could be obtained corresponding with the saving in freight.

Ammonium phosphate seems only to have been tested in one experiment in this country, and it did not come out as well as nitrate of soda. This experiment was made at Newton Rigg in 1911.

In the case of other nitrogen compounds it is necessary to ascertain by the direct trial already indicated their decomposibility in the soil and their freedom from harmful constituents. For purposes of preliminary sorting out a simpler test of decomposibility may be adopted. The substance is mixed with soil in the proportion of 100 mgms. nitrogen to 1 kilo. soil, keeping the soil moist, and determining the rate at which nitrates are produced, the first determination being made after 5 days, the second after 10, and the third after 20 days, or a longer period if necessary. A control experiment must also be made with soil alone. Ammonium salts rapidly and completely nitrify in these conditions, so also do some of the protein substances, dried blood, etc. A third lot of soil is therefore put up to which sulphate of ammonia is applied at the same rate; if this nitrifies quickly one can be sure that all the conditions were satisfactory. Substances that nitrify rapidly can then be tested by the more elaborate plant test.

As to price: the agriculturist always thinks in terms of "unit" prices—a unit being 1% per ton. Thus if sulphate of ammonia is £15 15s. per ton, the unit price of nitrogen is:—

Sulphate of ammonia contains 20% of nitrogen:

∴ 20 units cost £15 15s.
∴ 1 unit costs 15s. 9d.

A farmer will not expect to pay more per unit of nitrogen in other ammonium salts.

Prior to the war, the usual unit values were:—

		s.	d.
Nitrogen in	nitrate of soda	15	4
,,	sulphate of ammonia	12	6
,,	guano, rape cake }	19	0 to
,,	dried blood, fish and meat meals, etc. }	23	0

Protein nitrogen commands a high unit value because organic matter has certain useful physical effects in the soil.

Vegetable and animal residues contain a little potash and phosphate in addition to their nitrogen for which an allowance is made: for phosphates

about 1s. 6d. to 1s. 9d. per unit, and for potash about 4s. 9d. per unit before the war. These prices were for materials dried and ground in merchantable condition. Present prices are considerably higher, and the demand is being stimulated by Government and other action. Chemists will do well to keep watch on the situation to ensure that any nitrogen compounds they may have to spare shall be fully utilised.

THE ENCOURAGEMENT OF THE INVENTOR AFTER THE WAR.

A. P. LAURIE.

No country has neglected the inventor so much as ours in the past, and yet no country has had a more brilliant series of inventors. Many good inventions, no doubt, have perished for want of recognition, and many inventors have given up in despair owing to discouragement; but in spite of that we have a high record of scientific and industrial inventions which have finally come to fruition in this country. The war has brought a general awakening in this, as in other matters, and a realisation of the importance of scientific and industrial research and invention on the part both of the Government and of the general public.

It is necessary, therefore, to take advantage of this new attitude, and to draw up schemes which will enable the vague desire on the part of the public to promote invention and research to materialise in practical proposals.

One important step the Government has taken already is to establish a Department of Scientific and Industrial Research with funds at its disposal—a body which is already taking active steps in wise directions.

Without in any way interfering with the work of this department, but on the contrary supplementing and assisting it in its labours, there is another step required, and that is the development of the Patent Office, so as to make it a centre for the advice, encouragement, and assistance of inventors. I do not propose here to deal with the intricacies of the patent law, although, as is well known, many improvements are required; but to discuss what can be done to further assist the inventor after he has received protection for his patent.

The direction in which such assistance can be given has already been shown by a Department which was organised by the Prime Minister when head of the Ministry of Munitions. This Department is confined to dealing with inventions bearing on the war, and therefore has not to deal with so wide a range of inventions as would be necessary after the war; but the principles upon which it is organised seem to me to be all that is required in order to deal with this larger question. The Department consists of an expert staff very largely recruited from the Patent Office under a Comptroller, and a panel of men representing both pure and applied science, more especially in connection with the needs of the war, which is divided into committees to deal with different subjects, such as gunnery, machinery, etc., to which are attached expert secretaries.

The first business of these committees is to examine all inventions and suggestions made with reference to the better conducting of the war in the matter of supplies, including the examination of new patents. A careful enquiry with, if necessary, reference to other departments of the Government, or to men of science who may have a special knowledge of the point under discussion, is made in order to decide whether the invention has novelty or utility, and to advise the inventor accordingly.

When an invention seems to be of promise, the Department, being closely in touch both with the expert departments of the Government and with scientific laboratories throughout the country, arranges for the carrying out of preliminary experiments and investigations, and, if necessary, passes on the invention in order to bring it before the notice of manufacturers or Government departments likely to be interested, and arranges for its adoption, or for further experiments to be carried out on a larger scale, the expenses being defrayed out of the public funds for this purpose.

Necessarily from such enquiries, fresh ideas develop, and fresh researches may be undertaken, while more and more there is a tendency for questions to be sent to the Inventions Department from those actually engaged in manufacture with a view to obtaining a solution, so that an intricate system has developed between the inventor, the research bodies under the Government, the scientific laboratories in the country, and the manufacturing departments, this Department sitting in the centre of the spider's web and assisting and advising the whole.

Having been intimatly associated with the Department since the beginning, as a member of the panel, I can say without hesitation that it has done excellent work, as it has encouraged and assisted the inventor, and in many cases its labours have resulted in valuable inventions which are now being used in prosecuting the war.

If we imagine such a Department dealing with all inventions, it is evident that it would work in close association with the Department for promoting technical research with a view to passing on to it the responsibility of the research work necessary to develop certain ideas. In fact, although at present confining its attention to war work, this Department is already getting in touch, in many cases, with the Department of Technical Research, showing clearly that we have here two separate functions, viz., that of the Department of Technical Research and that of this new Department, playing into each other's hands, and mutually assisting each other.

One of the difficult practical problems which necessarily arises is how, when an invention has reached a certain stage, to deal with the individual manufacturer without giving him an unfair advantage over his trade rivals, but this particular problem will be solved if the efforts of the Board of Technical Research are successful in the formation of associations of manufacturers who would deal directly as an association with technical researches and new inventions.

There should be both a workshop and a laboratory under the direct control of the Inventions Department for dealing with matters in their initial stages, and an inventor whose inventions had been approved of by them should be given special facilities for the making of models and for the carrying out of experiments, and, where necessary on account of poverty, these facilities should be given free of charge.

The cost of electricity in the United States in 1915 was reduced to one-sixth of its cost in 1902, through the work of the Edison Company. Whereas the consumption of coal by this company was 1,100,000 ton in 1912, it would have been 2,600,000 tons on the basis of its furnace equipment in 1902.—(*U.S. Off. Gaz., Feb.* 13, 1917.)

The Mellon Institute has recently succeeded in producing a new yeast, which not only makes better bread, but effects a 2 per cent. economy in the use of flour. By this means the State of Kansas alone would be able to save 400,000 barrels of flour per annum.

THE PROFESSION OF CHEMISTRY.

LEEDS.

There was not a very large attendance at Leeds on Saturday, February 2, when a meeting was held at the University to consider the formation of a Leeds and Bradford Section of the British Association of Chemists. Not more than from thirty to forty were present, but on the whole it was a favourable meeting, and it was decided that a section be formed.

Dr. Rée, of Manchester, presided, and embodied in his opening address a *résumé* of the progress of the movement from its beginning, a general explanation of its objects, and an account of the overtures made to the Institute of Chemistry. Personally, he said, he deprecated the formation of a new society; he much preferred amalgamation with the Institute if the Council could agree to adopt the objects they had in view; but failing such agreement they proposed to go on definitely to the formation of a separate association. In future chemistry would have to play an incomparably greater part in the life of the country, but chemists would never take their proper place unless they could adequately influence public opinion, and they could not do that unless all genuine chemists were combined. The Institute had done a large amount of good for the profession, and had made some approach to unity; it offered a solid foundation upon which to build firmly; and the whole body of chemists, working with the Institute, would guide the destinies of the profession judiciously, and ultimately, he had no doubt, accomplish all, or nearly all the objects they had in view.

Dr. R. B. Forster, of Manchester, followed. He said the Institute of Chemistry represented about 1500, while there were at least 5000 properly-trained chemists in the country. The future progress of the country depended very largely upon its chemical industries, and they in turn upon chemists; and if they did not succeeed in raising the status of the chemist to its proper level among other professions, and in thereby attracting a sufficient supply of the best men, our chemical industries would ultimately be lost. As to certain criticisms that had been offered, he would ask, "If it is possible for a business man to employ a chemist, why is it not possible for a chemist to employ a business man?" He claimed that at least they should be equal, and that it should not be necessary for a man to forsake his profession in order to obtain a lucrative appointment. Originally, the Institute set out to attain the objects they were now seeking, but it failed to do so—he did not say from any fault of its own; but since then the great body of industrial chemists had sprung up, and the whole position was entirely altered. The object of the movement was not to confer degrees or a status upon those who had not got the one and were not qualified for the other, but simply to secure recognition and status for those who were qualified, to bring the men together in local sections, and to decentralise the government of the profession.

Mr. F. W. Richardson, City Analyst of Bradford, stated at length the position of himself and other Associates and Fellows of the Institute, as set forth in the report of the Leeds meeting on January 19 (this J., 1918, 28 R), and submitted with a good deal of spirit that the (b) qualification for membership of the Association was not creditable to the acumen of a body of intelligent chemists, and would lead inevitably to degradation, as it had done in other cases. They were all of one opinion, that the chemical profession needed raising, and if the Association could accomplish this it would do excellent work; but under the suggested alternative qualification it would be quite possible for, say, a man in a gasworks to be admitted who spent his time testing gas liquors and acids—on the plea that if he did not do certain things the works might blow up, and therefore that he was in a "responsible" position. At the same time, he admitted that a strong Association might, apart from consideration of qualifications, do very useful work in looking after the interests of the profession, as in the case of the British Medical Association with reference to the medical profession.

Various questions were asked or suggestions made by Mr. F. Hulse (Leeds), Mr. W. Nicholl, and Mr. R. Gawler (Leeds), and Dr. Rée and Dr. Forster each briefly spoke again, mainly in reply to Mr. Richardson, with the view to establishing an assurance that care would be taken to admit only adequately-qualified men, and to showing that (with a time limit, as proposed) no progress could be made without some provision for the admission without examination of men holding really responsible positions now.

It was then resolved, without any contrary vote, on the motion of Mr. W. Harrison (Leeds), seconded by Mr. Bernard Hickson (Castleford), that a local section of the Association be formed. Subsequently the following were elected to constitute the local committee:—Dr. L. L. Lloyd, and Messrs. P. E. King, W. Harrison, B. Hickson, J. C. Oxley, A. Silverwood, R. C. Wilkinson, J. C. Smith, C. E. Barraclough, W. Nicholl, G. Sargent, and J. Pomphrey.

LONDON.

A meeting of London chemists was held in the lecture theatre of the Royal Society of Arts on February 4. The Chair was taken by Mr. A. R. Ling, the Vice-Chairman of the London Section of the Society, in the absence of the Chairman, through indisposition, Mr. Ling explaining that the meeting was not one of the London Section of the Society of Chemical Industry but a gathering of London chemists held under its auspices.

Prof. J. S. S. Brame began the discussion with a summary of recent events, and in commenting upon the negotiations between the Institute of Chemistry and the British Association of Chemists, remarked that the former had gone a step further in the right direction than the latter by demanding that a university graduate should have had practical experience in works before he could be regarded as qualified. In view of the fact that the Institute had obligations to its own examinees, it had gone a long way to meet the Association; but although its past record was good, it had failed to cater for the industrial chemists upon whom the future of the chemical industries will so much depend. The Institute was much handicapped by its Charter, in which the expression "the profession of analytical and consulting chemist" figured so frequently. It held its first examination in technological chemistry in 1906, but to this day that subject was not a qualifying one for the associateship. Referring to Mr. Pilcher's statement at Newcastle, that the doors of the Institute were open to all qualified chemists who could take its examinations, Prof. Brame said that it was of no use nowadays just to open doors and expect people to walk in; it was well-nigh impossible for men engaged in industry to work up for any specific examination, and evening work in technical institutions should receive more recognition. Whether a British Association were formed or not, the time was now ripe for the consideration of all the matters it had brought forward.

Mr. E. W. Smith, of Birmingham, said that it could not be too definitely stated that so far the

main object of the Association had been to establish a registration authority for all qualified men. It had not asked the Institute to confer its associateship on any men merely because they were registered as chemists, but had inquired if the Institute would organise a registration body, and, in the event of this being found impossible, if it would include certain types of training within its qualifications and confer the A.I.C. upon men possessing such training. The Executive of the Association did not contemplate forming a registration authority itself, and it had only put forward the second alternative as a makeshift. As the Institute had considered the proposals, it would not be out of place to refer to the state of the negotiations. The Executive felt strongly that no permanent association should be organised until the views of chemists in all parts of the country had been ascertained. Unity among chemists was absolutely essential, and it would be much better to obtain it by compromise than by organising something immediately which would be irrevocable and lack strength. It was no part of the policy of the Association, or of the Institute, to lower the standard of the chemist. Speaking for himself, he thought that the Institute had met the proposals as far as it possibly could under its present Charter, but it had not gone far enough.

Prof. Brame had made a strong point of the necessity for practical experience for the B.Sc. They would all admit that that was desirable, but the object of the Association was not to create any kind of standard by which it would be impossible for a man without practical experience to be considered a chemist. The essential difficulty at this stage was in defining what should be the minimum qualification for a chemist. Without putting it forward as final, it was felt that any person holding a university degree with chemistry as the principal subject should be called a chemist, and it was also thought that any man who had had a certain amount of evening class training and who had also had years of experience and now held a fairly responsible position should also be covered by the same definition. They could go a little further and hold out the hand to the man of 23 or 24 years who had been for two or three years in chemical work but who had no academic training. It would be a simple thing to arrange that such men should be fully fledged members of the registration body without taking any active part in the management of it. The negotiations with the Institute had got to this stage: that the Institute was prepared to agree to the university degree qualification being continued to the end of the war. As he understood it, that meant that the man who the Association had in mind could during the war get into the Institute, and that the man who had had seven years' experience, was 27 years of age, and had received a good general and scientific training could be admitted as an Associate up to 1921. When the British Association placed its proposals before the Institute it made it clear that they were put forward as providing a basis for discussion. It was hoped that the Institute would become the registering body, but unfortunately it had not, apparently, sufficiently considered the matter from that point of view, and had come to the conclusion that the only way in which it could help was by increasing its own membership by making A.I.C.'s and F.I.C.'s. That did not fill the bill. An organisation of chemists was wanted which would be a live and militant organisation, not a trades union, but a professional association.

It was intended to hold a national meeting at Manchester in a short time to deal with the form the new organisation should take, and they asked for the views of London on that occasion. He could assure them that such an organisation would be created in Manchester, but not, as some might say, in opposition to the Institute. If anything were done it would be in the form of a registration body with local sections to register all men who could call themselves chemists; and one means for dealing with the question of qualification would be that each local section would have representatives on a Committee which would also contain, it was hoped, representatives of the Society of Chemical Industry, the Chemical Society and the Institute. This Committee would determine the minimum qualifications necessary for a man to rank as a chemist. The Committee would then draw up the constitution of the registering body and indicate its possible activities. It was hoped that the Institute would thoroughly discuss the matter (there had been very little discussion so far), and find it possible to be a great deal more definite in its reply than it had been up to the present. Finally, he hoped that a local branch of the Association would be formed in London, and that its representatives would attend the meetings of the Executive Council and so help the work that was going on all over the country.

Prof. F. G. Donnan said that, without wishing to disparage what the last speaker had said, it seemed to him that his speech was a sort of apotheosis of the blessed word "register." No doubt if the scheme went through they would pay a registration fee of 10s. or 5s., but what would happen next? He could understand it if it was going to be a trade union—an attitude that need not necessarily be laughed at. He did not know what the distinction between a trade union and a professional organisation was; it was a very fine point. He wished, however, that the British Association of Chemists would be quite frank about what it wanted. If it was desired to get a great body of chemists to take parliamentary or legal action that would be an excellent thing, but at present it was not quite clear what was intended. They got to the word "register" and then all was mystery. He believed the Institute was moving and was meeting a very considerable amount of the desire expressed by the Association and others for widened action, but there were two classes of men who had not joined the Institute of Chemistry. The first was the growing class of young University men who either continued at the Universities as researchers and teachers or went to schools as such, or went into industry or became professional consultants and analysts. These men had a University degree and they would not sit for another examination. The Institute had very fairly met these men because it had agreed to admit them to associateship. The second class of man was the one who had not had a University or high school education and who had gone into the industry perhaps early in life and had done well and obtained a wide knowledge of various branches of the industry and was in a responsible position. The difficulty was whether the Institute by its Charter could take these men in. He thought they ought to be taken in and if necessary the Institute should get a new Charter to enable it to do so.

Mr. N. A. Anfilogoff said what was needed was a trade union or a professional union parallel to the unions of the engineers, doctors and lawyers; and if the Institute could not adapt itself, even by dynamiting its Charter, then a new body must take its place There were plenty of young men of good education who were precluded from sitting for the examinations because they had not matriculated—very often for purely financial reasons. The interests of those men who had risen from the "lab. boy" stage to responsible technical positions must also be looked after by the new association or trade union, which in

addition must certainly see that the young chemist is guaranteed a minimum wage.

Mr. C. H. Aldred contended that the Institute of Chemistry had drifted into the scholastic professional branch, and was too much in the hands of the professors. He belonged to it for some years and all he got each year was a balance-sheet and a request for his subscription. He failed to see that it had done a single thing for the British chemist and he had come to the conclusion that he could do a great deal better with the two guineas subscription. If a really effective organisation had existed, the very low wages offered to chemists at Woolwich would not have been possible; and even at the present time chemists were told to apply to the nearest Labour Exchange!

Mr. J. H. Coste, speaking on the question of registration and of definition, suggested that a chemist should be defined as a person who practised chemistry as his principal occupation. If the new Association could obtain details of all the people who were doing that, a good deal of progress would have been made. The Institute was not able to do quite as it liked, its Charter was granted by Queen Victoria, and if it came up for amendment it would have to stand the fire of all the other societies. The Institute was pursuing its recognised original function of regulating the profession of the analytical and consulting chemist, but some new body was needed with the functions of the General Medical Council, although in the medical profession there was also the British Medical Association which was the trade union of the profession. In any case it was desirable that the chemical industry should have some body which could undertake registration, and with that object in view he moved:—

> "That it is desirable to make a register of all those who are practising chemistry as their principal occupation in this country."

Mr. F. C. A. Lantsberry said it was evident from the large audiences that had been drawn together in different parts of the country that there was an opinion in the country in favour of registration. The difference between a professional association and a trade union was that the former demanded a standard of ability on the part of its members which a trade union did not. The British Association of Chemists very much hoped that the Institute would recognise the feeling in the country that it was possible to do more for chemists than it was doing at the present time. He wished to dispel the idea that the Association consisted very largely of men who were not members of the Institute, but who desired to become such. Many of the members of the Provisional Association were Fellows or Associates of the Institute, and the fact that this was so must surely bring home to the Institute that there was something which it was not catering for. He hoped the meeting would pass a resolution in favour of the objects of the British Association and resolve to form a London branch.

In seconding the motion of Mr. Coste, Mr. Ellis said the Institute had apparently awakened to the fact that there were many chemists who did not possess its degrees. If the Institute was going to represent the profession its degrees must be open to these other chemists, and there must be also some registration authority. He also agreed with some of the previous speakers that a kind of trade union was necessary for chemists. He could not imagine that the Institute could ever develop into anything of the kind that was really needed.

Mr. A. C. J. Charlier thought that everybody would agree that even supposing the Institute was able to alter its Charter, nothing had been said that evening which indicated that chemists generally would obtain a degree like that of the A.I.C. For this reason he hoped that all industrial chemists present would not readily approve the suggestions that had been put forward. It was said that the British Association had initiated this movement, but he very much doubted that, because the National Association of Industrial Chemists, of which he was the President, was started last June, whereas the British Association was started in November.

Mr. G. N. Huntly said that on the question of registration the attitude of the British Association seemed hesitating. It said that it would like the Institute to do it, and the Institute said it would like to, but did not dare. Whatever was done, whether in the direction of legally defining the word "chemist" or of safeguarding the public, parliamentary action was necessary. The most practical thing would be for the British Association of Chemists to frame a Bill so that all the objectors to it could be heard in the ordinary way. He believed also that no registration body could be established without an Act of Parliament.

Mr. E. Gardiner then moved as an amendmen to Mr. Coste's motion:—"That a London branch of the British Association of Chemists be formed."

Mr. Cooper emphasised the desirability of establishing some means of gauging a man's practical capabilities, of his power of resourceful action, and these would have to be taken into consideration by the registration authority.

Mr. Anfilogoff seconded Mr. Gardner's amendment, which was put to the meeting and declared carried on a show of hands. It was then put as a substantive motion and carried by a very large majority.

Prof. Brame moved that a Committee of 10 or 12 be appointed to deal with the question and to report to a further meeting of London chemists.

This was agreed to, and the following Committee was elected:—Prof. Donnan, Mr. W. F. Reid, Mr. G. N. Huntly, Mr. Gardiner, Mr. F. H. Lees, Mr. G. H. Perry, Mr. Anfilogoff, Dr. P. Haas, Mr. J. W. Hinchley, and Mr. W. G. Wagner.

The Chairman said this provisional Committee would get to work at once, and he hoped that as the outcome of their labours something would be done to further the aims and objects in view.

Mr. R. B. Pilcher, in parrying "some of the rather hard knocks" the Institute had received that evening, remarked that the Institute maintained that all the objects of the Association were already covered by it, and had been for many years. It must not be forgotten that besides the point of view of the chemists, individually and collectively, there was the standpoint of the general public to be considered. The Institute had a Royal Charter to serve the public, and in serving chemists it served the public. From the trade union point of view he could assure the audience that during the war the Institute had helped chemists who were not its members to the extent of 25 to 1 who were members. For months past the Institute had been working at very high pressure. Mr. Aldred and others had sai they did not know what the Institute had done, but they had never taken the trouble to find out. The Institute was always ready to help any chemists and had been ready to do so from the beginning. He had been more than 26 years with the Institute and knew something about it. With reference to Labour Exchanges, the Institute had arranged that when explosives works required chemists they need not go to the Labour Exchange, but could obtain them through the ordinary channel, viz., the Institute of Chemistry. Ninety-six per cent. of the appointments as public analysts were held by Fellows of the Institute, and that was a case in which a properly qualified man was necessary in the interests of the safety of the public. He would

be very pleased to help the Secretary of the London Section in any way that he could.

The CHAIRMAN said that he was an old Fellow and supporter of the Institute, but he felt that something which did not exist at the present time was necessary to place the status of chemistry on a level with that of other professions. He did not care whether it was done by the Institute or by the Association.

Mr. C. S. GARLAND thought it would be deplorable if another association was formed, as already the chemist had to pay too many subscriptions. It must be recognised that the Institute was making its examinations such that very few chemists had the courage to enter for them During the last 30 years it had failed to do what it could have done, and what the new Association wanted it to do. The Institute must realise that chemists wanted something more than an office. They wanted to have a voice in the election of the Council. The Institute had recently made new rules for the election of Fellows. They were wide and sweeping regulations, and although the views of the Council were circulated, there was no general meeting held at which Fellows could express approval or otherwise. He believed these rules received strong criticism in another place and that the Council had more or less to climb down from their original attitude. The legitimate aspirations of chemists, must be looked after. If the Institute would do it, so much the better, even if it meant a considerable amount of trouble.

Both the Institute and the Association have issued reports on the negotiations which took place on December 14, 1917, between the Council of the one and the Executive Committee of the other. The proposals submitted by the Association were as follows :—

> (A) That the Institute of Chemistry should become the sole registration authority for chemists—an authority bearing no relation whatever to the granting of the diplomas A.I.C. and F.I.C.—with a view to the Institute carrying out the objects of the proposed British Association of Chemists as outlined in the circular calling the meeting held at Manchester on November 10, 1917.
>
> (B) If the Institute cannot see its way to modify its constitution to carry out the first proposition, that it should adopt as a minimum qualification for A.I.C. the (*a*) and (*b*) qualifications of the proposed British Association of Chemists and adopt the objects outlined in the circular convening the meeting held on November 10, 1917 ;
>
> *Provided* that after 1921 only persons qualified under (*a*) of the British Association of Chemists qualifications be eligible for A.I.C.
>
> (C) That Local Sections should be formed and that the Council should consist largely of representatives from such Sections.
>
> (D) That should the Institute decide on having a separate registration body, the latter should be self-governed and should carry out the objects of the proposed British Association of Chemists.

The objects referred to are as given in Resolution II. of the Manchester meeting (this J., 1918, 4 R) ; and the proposed qualifications were :—

> (*a*) The holding of a University Degree (or its equivalent) with Chemistry as principal subject. (*b*) The production of satisfactory evidence of a sufficient general education, and of having practised pure or applied chemistry for not less than seven years ; the holding of a responsible position. This clause to be applicable only until December 31, 1921.

The Executive of the Association now reports that it interprets " general education " to include " scientific training," and that it has decided to postpone consideration of sections B, C, and D of Resolution III. (this J., 1918, 4 R) until after the next General Meeting, and to devote its energy to the organisation of Local Sections and to negotiating with the Institute.

The Council of the Institute has issued the following reply :—

The objects of the Association are practically included in the aims and objects of the Institute ; it therefore deprecates the formation of another body of chemists for carrying out those objects. The Council does not deem it advisable to adopt the proposal concerning registration (*v.s.* A).

The Council is prepared to submit to the Fellows and Associates of the Institute in Extraordinary General Meeting the following modifications of the regulations and constitution of the Institute with a view to meeting proposal B, so far as the Council deem it advisable to do so :—

> 1. That the Council modify the existing regulations of the Institute in order to include as many chemists as possible in the Membership (Associateship and Fellowship) of the Institute, *so far as such a course is compatible with the provisions of the present Charter.*
>
> 2. That any candidate who has complied with the following conditions be accepted as eligible to apply for admission to the Associateship of the Institute :—
>
> (*a*) That he has attained the age of twenty-one years ; and *either*
>
> That he has obtained a degree with first or second class honours in chemistry (or other degree or diploma recognised by the Council as equivalent) after a three years' systematic day course, and (i.) has taken a further year's training in chemistry at a recognised University or College ; or (ii.) has had two other years' approved experience* under a Fellow of the Institute, or in a laboratory or works approved by the Council ; *or*
>
> That he has obtained a degree with first or second class honours in chemistry (or other degree or diploma recognised by the Council as equivalent) after a four years' systematic day course ;
>
> *Provided* in every case that the candidate has produced satisfactory evidence of training in physics, mathematics, and an optional subject.
>
> (*b*) That until December 31, 1921, candidates of twenty-seven years of age and upwards who have complied with the conditions prescribed in qualification (*b*) submitted by the representatives of the proposed British Association of Chemists should be accepted as eligible for admission as Associates of the Institute, *provided* that they have complied with the provisions of the Charter of the Institute with regard to general education, scientific training (in chemistry, physics and mathematics) and the passing of class examinations held in connection with such training.
>
> *Note.*—In considering applications under this clause the Council will expect candidates to produce evidence of having been trained and occupied in a manner which in the opinion of the Council is equivalent to fulfilling the conditions required of candidates admitted under (*a*).

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*One year may be accepted by the Council as sufficient where the approved experience in a laboratory or works has been acquired *subsequently* to the prescribed training in a recognised University or College.

(c) That candidates who have not complied with the conditions specified in (a) or (b) immediately above or with the regulations adopted as a temporary (war) measure, be required to comply with the regulations adopted by the Council in July, 1917.

3. That the standard of qualification for the Fellowship of the Institute should be maintained at a decidedly higher level than that for the Associateship.

4. That the list of Institutions recognised by the Council for the training of chemists should be reconsidered with a view to its further extension.

5. (a) That local branches of the Institute be formed in important centres where a membership of not less than, say, forty can be assured.

(b) That the main objects of such branches should be to maintain the interest of the members in the general welfare of their profession and to promote social intercourse.

6. That steps be taken to revise the present system for the election of the Council in order to give the general body of members greater freedom of nomination.

THE SHEFFIELD ASSOCIATION OF METALLURGISTS AND METALLURGICAL CHEMISTS.

The first formal meeting of this Association was held at the Royal Victoria Hotel, Sheffield, on February 4. The attendance numbered approximately 200, and it may now be taken as assured that the Association will become a permanent institution and exercise an important local influence.

Dr. W. H. Hatfield, President, delivered an inaugural address on the rules and objects of the Association.

After the address the conveners of the different Sub-Committees reported progress upon the work accomplished to date with regard to the headquarters, library and club, and the business arrangements. A general discussion then ensued, opened by Dr. J. E. Stead, (Vice-President of the Iron and Steel Institute), who offered his good wishes to the Association and said he thought it would fill an extremely important position in the industrial life of Sheffield. It was a sign of the times and of the influence of the war in modifying the point of view of industry that such an Association could be formed. He thought also that the creation of a club in connection with a scientific institution was unique for the provinces, and he wished the Council every success in its venture.

Mr. Arthur Balfour (Past President of the Sheffield Society of Engineers and Metallurgists) called the attention of the Association to a new building which it was proposed to erect in connection with the Cutlers' Hall, for the housing of the Sheffield Chamber of Commerce. He thought that in carrying out this scheme it would be an admirable plan for the promoters to provide accommodation for this new Association. He wished it every success and he felt sure that the members would have the whole of the iron and steel industry behind them.

Mr. Rossiter Hoyle (Past President of the Sheffield Society of Engineers and Metallurgists), after congratulating the President upon his address, said he heartily agreed with the whole of the aims and objects of the Association and he was sure that his firm (Messrs. Thos. Firth and Sons) would give thorough and cordial support to the movement.

Mr. Clarke (Director, Messrs. Vickers, Ltd.) also offered cordial congratulations and good wishes.

Mr. F. K. Knowles (on behalf of Dr. Arnold, President of the Sheffield Society of Engineers and Metallurgists) raised one or two objections with regard to the clashing which might take place in the activities of the Association with the proposed British Association of Chemists.

Dr. Hatfield, in reply, said that both Associations had a similar object in view, and if they were endeavouring to arrive at the same result by diverse methods there could really be no question of clashing. He looked forward to the time when a definite collaboration could be attained and when possibly both Associations would be absorbed in something still greater. On behalf of the Council he wished to express their appreciation of the excellent support they had received that evening, not only from the members but from the manufacturers and representatives of the University and other scientific institutions. The purposes they had in view were of intimate interest and importance to the industry, and it only needed a continuation of the support they were receiving to make the Association a complete success. Dr. Hatfield also announced that it had been decided to form a museum for articles of interest in applied science.

NEWS FROM THE SECTIONS.

LIVERPOOL.

At a meeting held at the University on Friday, January 18, a paper entitled "The Chemistry of Gums" was read by Mr. H. B. Stocks, of which the following is a summary :—

Originally, the term "gum" was applied to any natural exudation from trees or plants, and thus substances like rosin, benzoin, copal, etc., were included under this heading; later, however, gums were classified separately from resins and gum-resins (this latter class including natural exudations which partake of the nature of both the former, *e.g.*, aloes, gamboge, myrrh, etc.). Gums are non-volatile, colloidal carbohydrates which are either soluble in, or swell up in contact with cold water, and are distinct from starch, dextrins, cellulose, and inulin. Early work on the chemical nature of these substances was confined to gum arabic and gum tragacanth—which were supposed to contain respectively "arabic acid" and "bassoric acid." Later, the researches on carbohydrates of Emil Fischer, Tollens and his pupils, and others, cleared the way for a more systematic examination of the constituents of the naturally occurring gums. The outstanding results in this direction are due to O'Sullivan, who has shown that the gums are not carbohydrates of the formula $[C_6H_{10}O_5]_n$, as at one time supposed, but in reality glucosidic derivatives of certain organic acids, and built up of the residues of sugar molecules united by ester oxygen to the organic acid which latter is different in different gums and is to be regarded as the nucleus of the particular gum. With regard to the composition of gums other than arabic and tragacanth, much work remains to be done, and success will probably be achieved on the lines adopted by O'Sullivan, viz., gradual hydrolysis by mineral acid (HCl), followed by fractional precipitation (by alcohol, etc.) and examination of the resultant products by physical and chemical methods. Enzymes are probably associated with the formation of gums *in situ*, but about this little is understood; in gum arabic an oxydase is usually present and gives a colour reaction with tincture of guaiacum, thus it may be distinguished from gum tragacanth, which contains no oxydase.

NOTTINGHAM.

The fourth meeting of the session was held at University College on January 23, when the Chairman, Dr. R. M. Caven, read a paper on "Soluble Glass."

It was pointed out that commercial sodium silicate, containing 2 or 3 parts by weight of silica to 1 of soda, scarcely dissolves in water, but that the concentrated solution of this substance required for technical purposes is at present prepared by acting on the latter with superheated steam, and evaporating the resulting dilute solution to the desired consistency. The production of a hydrated, readily soluble, solid form of such silicate has long been desirable. The solid would itself be useful and would be much more convenient for handling and carriage than the viscous liquid.

The author explained the chemical principles underlying recent patents for preparing soluble glass in a solid form readily soluble in water. Briefly, the processes consist in heating the anhydrous glass, suitably ground, either dry or in presence of water, with sufficient, but not too much, water, at from 70° to 100° C. for about four hours. The product is hard and vitreous, can be pulverised, is practically permanent in the air, and soluble even in cold water, leaving less than 5 per cent. of insoluble residue. Owing to the presence of traces of iron oxide in the fused soda-glass from which the soluble glass is prepared, a dark grey colour develops on hydration, which is attributed to ferroso-ferric oxide. Incidentally, the colour of unexposed flint, which is similar, is believed to be due to the same cause. This colour of the hydrated glass is not, however, detrimental since the solution of the glass may be bleached by oxidation, and afterwards all the iron is found in the small residue below a clear solution of the glass.

An interesting discussion followed, which dealt chiefly with the author's theory of the process of hydration, and with the problem of the iron coloration.

YORKSHIRE.

At a well-attended meeting held in Leeds on February 4, with Prof. Cobb in the chair, Mr. G. L. Moss, of Manchester, read a paper on "Modern Methods of Sulphuric Acid Manufacture."

In the main, the paper described a modern type of plant now being erected in different parts of the country, and it was illustrated by lantern slides of installations at work and in course of building; but besides this the author discussed in detail many points of practical interest to the manufacturer. A description was first given of the old-style chamber plant and the causes of its relative inefficiency were clearly indicated. The use of lava stone for packing Glover towers, and of coke in the Gay-Lussac towers, was now being superseded by patent packing, with great gain in efficiency and nitre economy. The introduction of mechanical burners for pyrites smalls created the dust problem, and efforts to mitigate this by various methods, had not been very successful. The problem of dearsenication was yet to be solved. The chief difficulties connected with the hydrogen sulphide process were that a diluted acid was necessary, and the filtration of the precipitated sulphide was not easy.

The modern type of chamber, built with steel supports and housed in a brick building, is about twice the height of the older type and its curved top helps further to increase the cooling surface. Circular and conical chambers, and the Opl system, were also mentioned, the aim of all these being to obtain a more intimate mixture of the gases with a maximum cooling effect. To this end water atomisers were now employed in the chambers instead of steam. The mechanical burners in the plant under notice are of the circular type, over which the ore is raked by air-cooled rabbling arms, the heated air being used for drying the ore. The dust and arsenic are removed from the burner gases by scrubbing with acid and filtration in the cold; re-heating being partially effected by counter-current with the hot gases leaving the burners. The gases entered the Glover tower quite free from dust, and the Glover and chamber acid were practically "water white." With regard to the different systems for adding nitre or nitric acid, the author inclines to the opinion that a combination of the two is the most convenient and economical. A short account was also given of the different systems of acid concentration (including that of spent acids from nitrating processes), and an improved Kessler method was described in detail.

MANCHESTER.

Mr. E. L. Rhead read a practical paper on "The Corrodibility of Cast Iron" before a well-attended meeting of this Section on February 1, in which he dealt with the predisposition of cast iron to corrode under conditions obtaining in chemical plant. Attention was drawn to the fact that the ultimate analysis of cast iron as usually stated gives a very imperfect indication of the purity of the metal. If the normal impurities in cast iron were reckoned as compounds they would constitute some 25 per cent. of the material instead of the 7·5 per cent. indicated by the usual method of recording the analytical results.

When the metal cools from fusion its ultimate character depends on the behaviour of the compounds present, and not on the elements. The carbide under certain conditions may decompose to form graphite, but the other compounds do not decompose. The portion last remaining fluid retains practically the whole of the phosphorus, and has a very low melting point.

In the solidification of castings the liquid portion subsides by gravity into the lower parts of the casting so long as a clear way exists, and produces cavities. In the attack of chemical vessels it was shown that actual corrosion had occurred on each side of the graphite flakes. Cavities in association with the phosphide eutectic yielded on exposure an efflorescence of iron salts in patches all over the fractured surface.

Reference was made to the very rapid failure of pans, after having been long in use, when subjected to more drastic treatment. It was shown that this was due to the surface having been removed by solution, thus exposing the more open and more highly phosphoric metal in the centre of the casting specimen, and analyses showing these differences were given. The ultimate cracking is due to the bursting pressure produced by the increase in volume due to corrosion.

In the case of high silicon alloys used for chemical vessels the same conclusions hold good; graphite should be absent and phosphorus at a minimum. Specimens showing the effect of the presence of both of these were exhibited and the analytical data presented proved that, when acted on by acids, the phosphide was attacked preferentially. Pellets were found in phosphoric silicon metal used for chemical purposes and the concentrations in the vicinity of blow holes demonstrated. Analyses of the pellets showed them to contain more than ten times the proportion of phosphorus present in the metal.

OBITUARY.

R. C. WOODCOCK.

Reginald Cowdell Woodcock, an original member of the Society who served several terms of office as Vice-President and Member of Council, died on January 5, 1918, at the age of 56. After an education at King's College School, London, he worked in Paris on a new installation for heating and ventilating the Pantheon, and on returning to London studied at the Royal College of Chemistry and became private assistant to Dr. Frankland. Early in 1872, Woodcock was appointed chemist to the Bede Metal and Chemical Co., of Yarrow-on-Tyne, but relinquished this post fifteen months later to take up the assistant-professorship of chemistry at the Royal Agricultural College, Cirencester. From 1878 until 1886 he devoted himself to analytical work under Mr. C. W. Wigner. The last thirty years of his active life were passed in the service of the Sanitas Co., Ltd., the first twenty being served with the American and Continental Company at New York, and the last ten in London. Woodcock was an ardent worker for the New York Section of this Society, and filled the office of Hon. Treasurer from the time of its inception to the date of his departure in 1906. On the occasion of the annual meeting of the Society in London in 1905, Dr. W. H. Nichols, the president, presented him with a gold medal from the members of the New York Section. Among the various contributions which Woodcock made to the literature of chemical technology, two papers, on the production of formic and acetic acids by the atmospheric oxidation of turpentine, appeared in the Journal of the Society (J., 1910, 791, and 1912, 265), both in collaboration with Mr. C. T. Kingzett.

Baird, W. Raimond, of 271, Broadway, New York City, U.S.A., on March 15, 1917.

Marsh, Wm., of The Union Alkali Co., Soho Works, Ancoats, Manchester, on December 28, 1917.

Milne, John, of 1, St. Mary's Place, Inverurie, Aberdeenshire, on December 17, 1917.

Remington, Prof. Joseph P., of 1832 Pine Street, Philadelphia, Pa., U.S.A., on January 1, 1918.

Woodcock, Reginald C., of 30, Dover Road, South Wanstead, Essex, on January 5, 1918.

Young, James, of 2, Montague Terrace, Kelvinside, Glasgow, on January 26, 1918.

OFFICIAL NOTICES OF THE SOCIETY.

THE SOCIETY'S NEW OFFICES.

The headquarters of the Society are now at—

CENTRAL HOUSE,
46 & 47, FINSBURY SQUARE,
LONDON, E.C.2.

TELEPHONE: LONDON WALL 7331.

TELEGRAMS: INDUCHEM, FINSQUARE, LONDON.

SPECIAL NOTICE TO MEMBERS.

Members are reminded that the Annual Subscription due on January 1, 1918, is 30s., not 25s. as in the past.

It is requested that cheques should be made payable to the "Honorary Treasurer" of the Society, and should be forwarded to him at the Society's Offices (see above).

COUNCIL MEETING.

The next Meeting of the Council will be held on Friday, February 22, at 5.15 p.m., in the Society's New Offices.

MEETINGS OF OTHER SOCIETIES.

COKE OVEN MANAGERS' ASSOCIATION.

At a meeting of the Midland Section of this Association in Sheffield on January 26, Mr. B. Wilson Haigh, manager of the Barnsley Main Colliery Company's by-product coking plant, and Mr. H. Lamb, chemist, submitted a joint paper embodying a method of testing crude coke oven benzols, supplementary to the established retort test, and also a method for the ready determination of comparative values on the basis of the proportions of rectified products recoverable from crude benzol.

For the first-named purpose a 150 c.c. distillation flask with side tube is used, a Liebig condenser, and a thermometer graduated in fifths from 70° to 130° C., the readings of which are corrected to standard. With a range of samples varying from 40 to 70 per cent. distillate at 120° by the retort test, readings had been taken at 84°, 90°, 100,° 120° and 130°, and the variations in quality were shown on a chart in relation to the corresponding retort results; the advantage being that an indication is given of the relative proportions of benzene, toluene and xylene, and also of any unusual quantity of carbon bisulphide in the sample.

For the second purpose the apparatus used comprised a Young's rod and disc fractionating column with 20 discs, a round-bottomed flask and Liebig condenser, and a thermometer ranging from 90° to 210° C. Distillation was carried up to 200° C. (corrected), and the results of many tests were shown in the paper in tabular form, and also in a graph by the aid of which the value in any case in relation to standard crude benzol (65 per cent. distilling at 120° in the retort test) could at once be ascertained.

Incidentally the paper raised a variety of interesting practical points in benzol recovery, and thus evoked considerable discussion. It was generally agreed, however, that while the prevailing retort test is useful for works purposes where there is not much variation in the coal carbonised, it is quite inadequate as a test for the sale or purchase of crude benzol.

ROYAL SOCIETY OF ARTS.

A paper dealing mainly with the recent history of the margarine industry in this country was read by Sir W. G. Watson, Chairman of the Maypole Dairy Co., on January 30.

The success of margarine could not be ascribed to the similarity of its appearance to butter, for the Danes, who consume more per head than any other people, passed laws many years ago to forbid manufacturers making margarine which was coloured to resemble butter. These laws caused a great increase in the home consumption of Denmark and induced its biggest manufacturer, O. Monsted, to build works in England in 1888, in order to retain his British customers, who insisted on having the coloured product. To-day, 80 per cent. of the margarine produced in England is made under the control of men trained by him. Margarine production in 1916 was much curtailed owing to the "conditional sales," but when these were prohibited early in 1917 the production increased very greatly. The average quantity of margarine manufactured weekly in Great Britain in the years 1913 to 1917 was (in tons): 1611, 1728, 2219, 2479 and 3564 respectively. About 90 per cent. of the margarine manufactured is now made exclusively from vegetable oils, and, in the author's opinion, such margarine, when

scientifically prepared, is superior to that made with animal fats.

Sir W. G. Watson then spoke of the great improvements, due to physical and chemical investigations, which had been effected in recent years, and in particular in the processes used for refining the crude oils: and after describing the process of manufacture in outline, said that in view of the facts that the raw materials, copra, palm-kernel and ground nuts, were obtainable from within the Empire, and that there was a prospective great shortage of butter and animal fats in Europe owing to the depletion of cattle stocks, the future of the British industry was assured, provided only it were conducted under the expert guidance of the best chemists.

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

The Non-Ferrous Metal (Industry) Bill.

In the House of Lords, on January 30, the Second Reading was moved by Lord Hylton, and opposed by Earl Beauchamp, who objected to the Bill mainly on the following grounds: it was a negation of Free Trade; it admitted of too much State interference; it was vindictive; it would not prevent the enemy from "cornering" markets, as he would be able to work through friendly neutrals; and it would not facilitate the supply of metals to this country. Lord Balfour of Burleigh, in supporting the measure, urged that no abstract rule of Free Trade should be allowed to dominate at the present time; it was not the object of the Bill to bring supplies to this country, but to prevent the enemy from restricting smelting elsewhere than in Germany; Government control was now a necessary evil. The Marquis of Crewe opposed the Bill as it tended to discourage the continuance of London as the main centre of international trade in the metals, and he thought it might encourage the creation in this country of an English Metallgesellschaft. He denied the relevancy of Free Trade or Protectionist arguments and instanced the recent dearth of optical glass as a case which no economic legislation could have prevented. The control of vital materials could only be established by controlling the sources of supply, and our possession of these gave us an incomparably better weapon than any possessed by Germany; by inflicting disabilities on Germany now we should discount largely the effective use of this weapon later on. Earl Russell, speaking with inside knowledge of the tungsten industry, agreed that the control of the sources of supplies was all-important. The Bill was intended as a kind of national defence, but he did not think that it would achieve much; it would tend to hinder the financial and commercial interests of this country from dealing in the particular metals.

Earl Beauchamp did not press his motion for rejection, and the Bill was read a second time.

The Committee stage was taken on the following day. Viscount Bryce moved an amendment to reduce the period of the operation of the Act from five years to one year after the end of the war. It was a mistake to legislate for post-war conditions when we had no idea what those conditions would be. The amendment was rejected by 38 votes to 14. An amendment moved by Lord Hylton enabling naturalised British subjects of German origin who lost their German nationality before the war, to come within the scope of the Act, was agreed to; and a drafting amendment was also passed. The Lords' Amendments were considered by the House of Commons on February 5, and agreed to.

HOUSE OF COMMONS.

Basic Slag.

Captain Wright asked the President of the Board of Agriculture whether an application made by the Staveley Coal and Iron Co., Ltd., to supply basic slag to farmers in Derbyshire had been refused on the ground that 25,000 tons must be sent to Ireland; and whether he would take steps to secure that English farmers should not be placed in a worse position to Irish farmers as regards the supply of this fertiliser. Mr. Prothero in reply said that basic slag ground in Derbyshire and the neighbouring counties had been reserved for a time in order to meet Irish requirements. English farmers are now receiving more basic slag than they did before the war, and Irish farmers have not received more than their proper share having regard to their acreage of food crops.—(Jan. 28.)

Molasses and Spirits.

In reply to Major Davies, who asked if any molasses or spirits were being imported for use in the manufacture of munitions, and if the necessary spirits could be made by redistilling immature whiskey already manufactured in this country, Sir Worthington Evans (Joint Parliamentary Secretary to the Ministry of Munitions) said that such material was being imported, and that it has been decided for the present not to make spirits in the manner indicated.—(Jan. 29.)

*Premier Jus.**

Mr. Houston asked a series of questions concerning the stocks of premier jus awaiting shipment in the Argentine, and wanted to know why this material was not on the priority list for shipment. Sir L. Chiozza Money replied that there was an accumulation of various foodstuffs in the Plate, but any additional space provided for premier jus would be at the expense of grain. In determining the priority allocation of the space available, the Ministry of Shipping is guided by the view of the Food Controller.—(Jan. 29.)

Sugar-Beet.

Mr. Houston asked the President of the Board of Agriculture whether it has been proved by experiment that sugar-beet can be cultivated in this country, and whether he can explain why the cultivation of sugar-beet has been neglected during the war, in view of the shortage of sugar in this country.

Sir Richard Winfrey (Joint Parliamentary Secretary to the Board of Agriculture): The answer to the first part of the question is in the affirmative. But it has not yet been proved that the cultivation and manufacture are commercial propositions. The limited resources of the country do not at present justify the Board, on the ground of the extra amount of food obtainable from the soil, in demanding the machinery and buildings required for a sugar factory. Farmers have been making every effort to maintain and increase their normal production of food. It would be difficult to induce them to embark upon the growth of a new crop requiring for its cultivation special knowledge, a large quantity of fertilisers, and a greater supply of labour and of skilled labour.

* A tallow prepared by rendering the body fat of the animal at a low temperature, and generally in contact with water.

Mr. Houston: Is the Hon. Gentleman not aware that it does not require any extensive factories or machinery to extract the syrup from beet, and are there not plenty of German prisoners of war accustomed to beet-growing?

Sir R. Winfrey: The conclusion come to is that it is not a practical proposition in war-time.—(Jan. 29.)

Mr. Field asked the President of the Board of Agriculture what encouragement, if any, has been given to promote the growth and manufacture of sugar-beet in England; whether he is aware that the by-products and leaves contribute valuable food for cattle, and that in France it is utilised to aid the production of cement; and whether he is aware that many millions per annum are paid to foreign producers and manufacturers for this food commodity, which could be largely produced in the three kingdoms.

Mr. Prothero in his reply referred to the answer given on January 29 (*v.s.*); with regard to cement, he understood that waste lime from the treatment of sugar beet juice was sometimes used for making cement. "I hope that it may be possible after the war to build up a sugar beet industry in this country, which, apart from other considerations, would be of great value to agriculture."—(Jan. 31.)

In answer to an inquiry by Sir P. Magnus, Mr. Prothero said that it must be regarded as unsettled whether sugar-beet can be grown profitably in this country. The estate recently acquired in Nottingham, through the Development Commission, would be used to experiment in this direction. The Board had issued a pamphlet [Cd. 6162] giving full particulars of the cultivation of sugar-beet. There is little seed of good sugar-producing quality in the country at the present time.—(Feb. 5.)

Sir R. Winfrey, in response to Sir A. Fell, stated that beet syrup produced by crushing and boiling would be of little use for sweetening, and also unpalatable. The Board was not prepared to embark on experiments at a time when every effort should be concentrated on other crops which were known to yield assured results. Although some beet seed is obtainable commercially in this country, the Board is not sufficiently sanguine as to the results of experimenting to seek to obtain seed from foreign sources. No experiments have been made during the war.—(Feb. 6.)

Metal Scrap.

Replying to Mr. R. Gwynne who inquired whether scrap iron and brass, copper, zinc, etc., are sold to outside contractors, and if the Ministry of Munitions would take over its requirements directly and save dealers' profits, Sir W. Evans said that brass and copper scrap from the Army and Navy is taker over direct when required by the Ministry. Zinc scrap has to be remelted before it can be used by the Ministry and is allowed to be sold to the smelters for this purpose.—(Jan. 30.)

Flax in Ireland.

Answering Mr. Kelly, Sir W. Evans announced that the total quantity of flax purchased by the Government in the Derry market up to the present date was 274 tons, but that none of it was of sufficiently high quality to be classed as "special grade."—(Jan. 31.)

Shellac.

Sir W. Evans, in reply to Mr. Wilkie, said that arrangements had been made for obtaining shellac for munition purposes direct from India to be supplied to Government contractors at 11s. 6d. per cwt. The present high market prices are apparently due to speculation, with which the Ministry of Munitions has no authority to deal, as it does not endanger supplies for munitions.—(Feb. 5.)

NEWS AND NOTES.

AUSTRALIA.

The Commonwealth Government has prohibited the importation and exportation of copra unless the consent of the Customs Minister has been obtained.

The Queensland Government intends opening an arsenic mine in the Stanthorpe district. It is anticipated that the price of production will be £20 per ton, which compares well with the present market price of £70. Arsenic compounds are wanted to clear land infested with the prickly pear.

CANADA.

About 25 miles north-east of Ville Marie, on the shores of Lake Mackenzie, a number of veins of high-grade asbestos have been discovered. The average width of the veins is said to be about 4 feet, and they have been traced for quite a considerable distance. About a dozen claims have already been staked, on all of which it is said the showings of the mineral are very encouraging.

* * *

The high cost of coal in Canada again brings up the question of the manufacture of fuel from the immense beds of peat in various provinces. Extensive experiments were made some years ago by Dr. Haanel, of the Department of Mines, but they were not followed up. The fuel crisis brought about by the war has forced the Scandinavian countries to go anew into peat manufacture. The output of peat fuel in Sweden last year was 22,500 tons, but this year it will exceed 100,000 tons. Denmark, which produced 200,000 tons in 1916, will have an output this year of over half million tons. In Norway there are now 217 peat machines working to full capacity. Each of these machines, which cost about $13,500, and can be worked by two men, will turn out 35 to 45 tons per day. It would be well for the Canadian Government to import a couple of these machines, which appear to be standardised for their purpose, and renew the experiments on Canadian peat.—(*Can. Chem. J., Dec.,* 1917.)

NEW ZEALAND.

Plans have practically been completed for the erection of a marine salt works on the beach near Christchurch, at a total cost of about $75,000, where it is intended to manufacture sufficient salt to supply a large number of the markets of New Zealand. The works and evaporating areas will occuply about 400 acres, and the water will be pumped by electricity, the same power being also used for refining.—(*U.S. Com. Rep.*)

* * *

H.M. Trade Commissioner reports that the presence of molybdenite has been determined in a sample of quartz from Upper Takaka, which is a new locality for this mineral. Tantalum has been found, for the first time in New Zealand, in sluicing concentrates from Addison's, Westport.

The *New Zealand Times* of October 12, 1917, announced that the first lot of pig-iron manufactured from Taranaki ironsand had been despatched on the previous day to a Dunedin firm; initial difficulties had been overcome, and a small furnace was turning out seven tons a day.

According to the *Christchurch Press* of November 3, samples were recently sent by a

petroleum prospecting company at Canterbury, to the Dominion Analyst, at Wellington of oil obtained from oil-borings at Chertsey. The samples were obtained from a depth of 1396 feet. The management of the company considers that there is a reasonable probability that a flow of oil will be obtained at a depth of about 2000 feet, and arrangements have been made to obtain sufficient 6-inch casing to reach that depth. The analyst is reported to have stated that the oil is crude petroleum.—(*Bd. of Trade J., Jan.* 24, 1918.)

SOUTH AFRICA.

During well-boring at Grahamstown, rock was found containing 10 per cent. phosphate. The deposits are said to be of enormous extent. As very little phosphate has previously been found in South Africa and foreign supplies have been stopped, this discovery is of considerable importance.—(*African World, Jan.* 5, 1918.)

A table showing the value of the Union's mineral output from the earliest date of existing records to December 31, 1916, gives the following totals for diamonds from the three contributing provinces: Cape, £142,082,895; Transvaal, £19,325,652; Orange Free State, £14,962,522.

A recent meeting of the Industries Board held in Johannesburg discussed the cotton production in the Transvaal, and reported very favourably on the extension of the industry. Twice the area is under cotton cultivation this year, as was the case twelve months ago, the total Transvaal area being about 4000 acres. The Rustenburg, Waterberg and Zoutpansberg areas are the principal ones, though some cotton is raised in Zululand. A Committee of the Board will probably visit the Rustenburg district shortly, and interview farmers on the prospects of an extension of cotton growing in the near future.

GENERAL.

Manganese in West Africa.—The cutting off or curtailment of the supplies of manganese ore from Russia, India, and Brazil has rendered the development and exploitation of other more accessible sources of very great importance. The manganese deposits at Dagwin, near Taquah in the Gold Coast Colony, which were discovered by the Government Geologist in 1914, have recently been taken seriously in hand, and it is a fortunate circumstance that ore is found only 200 yards from the Seccondee-Coomassie railway, at about 33 miles from Seccondee. At this point massive outcrops of psilomelane, with a little pyrolusite, are found on the crest of a ridge running N.E. for about 2½ miles, and containing 42—53 per cent. of manganese. Similar ore also occurs further still to the N.E. Up to July 31, 1917, 20,600 tons had been shipped, having an average content of 52 per cent. manganese. 4·6 per cent. iron, 4 per cent. silica, and 0·11 per cent. phosphorus; and the total shipments up to November 28 last ran to 30,747 tons. Many difficulties have been met with, such as labour shortage, the clearing of jungle, and high transport charges (railage to the coast, 33 miles away, is 7sh. per ton, lighterage 6sh. 6d., freight 60sh., plus a 10 per cent. war tax), but about 5000 tons of ore per month can now be mined and shipped. Although no accurate estimate of the extent of the deposits can be made, the authorities are satisfied that a huge tonnage is available.

Scottish Research Association.—At a representative meeting of industrial interests at Glasgow on January 22, it was decided to form a Scottish Engineering, Shipbuilding and Metallurgical Research Association, and a committee was appointed to draw up a memorandum and articles of association in co-operation with the Advisory Council of the Committee of the Privy Council for Scientific and Industrial Research.

Dye Research.—The Research Scheme instituted by the Society of Dyers and Colourists is now in active operation. Close co-operation has been effected with the Government Department of Scientific and Industrial Research which has given much assistance in the form of grants-in-aid and also helped in other ways. A great advantage derived from association with such a Department is that the risk of investigations overlapping those of other scientific bodies is prevented. The work of the scheme is divided into five sections, viz., Chemistry, Bleaching, Dyeing and Finishing, Calico Printing and Leather Dyeing, and there is a very comprehensive list of proposed researches; but it is being found difficult to find the necessary *personnel* with suitable qualifications to undertake the investigations.

Dyes in the U.S.A.—Before the war, the United States imported not only 90 per cent. of the dyes used, but also most of the intermediates for those manufactured in the country. Only seven firms were engaged in making coal-tar colours, and these worked either at a loss or without profit. Prior to July, 1914, about 10 per cent. of the country's requirements were met by natural dyes, but only two of these are native products. At the present time there are about ninety firms engaged in the manufacture of artificial dyes, and over one hundred making crudes and intermediates. American textile manufacturers have loyally supported the young industry, and although progress has been marvellous, its position after the war is by no means assured. During the past two or three years, considerable progress has been made in the utilisation of natural dyes, and it is now possible, for example to supply the Army with softer, heavier and warmer cloth, dyed with natural colours, than if direct or sulphur dyes were used. The discovery of new quick-acting mordants has made jig dyeing (with natural dyes) possible, and a method of high speed dyeing has been evolved whereby the cloth runs from a padding machine directly over the dye cans at a rate of 80—100 yds. per minute, and yields products which are eminently fast to soap and soda and reasonably fast to light. In this new method, osage orange is employed. The colour principle of the dye is the same as that of fustic, and with the same mordants and the same treatment it gives almost identical results; it differs, however, from fustic in being free from the cloudy red shades which are typical of Mexican fustic. Osage orange is being very widely employed as it can be mixed with any other natural dye and with practically any artificial colour, and it may be used on cotton, wool, silk, felt, paper, leather and wood.—(*Dun's Rev., Dec.* 1917.)

Bauxite in the U.S.A.—A report issued by the U.S. Geological Survey states that the output of bauxite in 1916 was 425,100 long tons, an increase of 43% over 1915. Of this output Arkansas contributed 375,910 tons, most of the balance coming from Georgia, Alabama and Tennessee. 300,000 tons were used for the manufacture of aluminium, 80,000 tons for chemicals, and 45,000 tons for abrasives and refractories. A considerable quantity was exported to Canada for the production of aluminium and abrasives. The total production of alum manufactured in 1916 was 27,257 tons, an increase of 10 per cent. over 1915. Eighteen plants are making aluminium sulphate and six of them are located at municipal or industrial waterworks, which consume their entire output. The total quantity of aluminium sulphate produced in the United States in 1916 was

153,860 short tons. The quantity of domestic aluminium sulphate which entered the market, 147,823 short tons, was less than the quantity in 1915 by 12 per cent., and the total domestic production fell off about 9 per cent. Aluminium chloride, which is used among other purposes for the refining of mineral oils, was produced at five plants in 1916, the total output reported being 3322 short tons. Bauxite abrasives sold under various trade names, such as alundum, aloxite, exolon and lionite, are made by fusing bauxite in an electric furnace. Some grades of nearly white artificial aluminium abrasives are believed to be made from alumina, and are sold in the form of powders, cloth, grinding stones and wheels of various shapes. The total production of artificial abrasives made from bauxite in 1916 was 30,708 short tons.

Monazite Sand.—The monazite sand industry in the U.S.A. was prosperous at the beginning of this century, but after 1910 the production ceased entirely for several years, and although it revived again in 1914, it has never recovered its former prosperity. The chief factors militating against its development are: the cheapness of labour in the competing countries, Brazil and India; the low cost of ocean transport; and the low thoria content of the Carolina deposits which compares badly with those of Brazil (6·3 per cent.) and India (9 per cent.). In 1916, 37,872 lb. of monazite sand were produced and 2,436,197 lb. imported, while less than half a ton of manufactured thorium nitrate came into the country from abroad. The following figures give the production of monazite sand (in short tons) in the U.S.A., Brazil, and India for the last seven years. The totals given represent the world's production, to which other lands, including Norway, contribute less than 0·1 per cent:—

	U.S.A.	Brazil.	India.	Total.
1910..	50	5994	nil.	6044
1911..	0	4064	931	4996
1912..	0	3746	1271	5018
1913..	0	1584*	1327	2911
1914..	0	661†	1307	1968
1915..	18	484†	1221	1723
1916..	19	—	—	—

—(*U.S. Geol. Surv*)

* To France, Germany, and the U.S.A.
† All to the U.S.A.

Zinc Manufacture in Mexico.—According to the Boletin Financiero y Minero de Mexico, of October 10, 1917, the International Ore Co., of Saltillo, State of Coahuila, is constructing two furnaces, each containing 300 retorts with a capacity approximating 40 to 45 tons per day and a daily production of zinc amounting to 15 tons. The cost of this project is estimated at about £18,000. —(*Ch. of Comm. J., Jan.* 1918.)

Pulverised Coal in Brazil.—The Central Railroad of Brazil is undertaking experiments at Barra do Pirahy with a coal-pulverising plant of American manufacture, which is said to resemble a cement plant and to have cost $500,000—$750,000. Dried coal is supplied to the plant from a hopper and is pulverised so that 80 % of it passes through a 200-mesh screen. It is then passed to the locomotive by means of a conveyor screw and blast, thus bringing the ignitable powder to the mouth of the locomotive furnace, at which point combustion takes place. The experiments, which were performed with American coal screenings, were entirely successful. A locomotive raised steam from a cold boiler to full-steam pressure in 1 hr. 5 mins., and after returning from a 112-mile run over variable grades, with steam pressure kept up all the way, the fire-box was found to be quite free from dust or clinker, the only residue being a little slag hardly sufficient to fill an ordinary fire-bucket. It is now proposed to experiment with domestic coal and American coal mixed, and afterwards with Brazilian coal from the Jacuhy district in the State of Rio Grande. This coal does not burn economically in lump form, but it is believed that in the powdered state it would give results at least equal to those from the powdered lignite used in the United States. If the experiments prove successful, they will open up an enormous field of possibilities, for the fuel problem in the Brazilian railways has been *the* problem for a long time past.—(*U.S. Com. Rep.*)

Coal and Petroleum in Angola.—The Acting British Consul-General at Loanda, Angola, reports that coal deposits are now being developed at Zenza do Itombe, situated 82 miles from Loanda. Whilst probably unsuitable for bunkering, the coal, which is highly bituminous, answers the needs of the railway, and will be utilised by the Government as soon as the difficulties of transport are overcome, the mines being distant some 8 miles from the station of Zenza.

The mines were formerly in the hands of a Bremen syndicate, formed to exploit minerals such as copper and iron, in the Golungo district, but the copper ore was found to be of low grade and, owing to transport difficulties, hardly worth exploiting. Should, however, the coal mines prove successful, the copper mine might become more lucrative. The present proprietors of the mines are a Portuguese firm.

A company, formed with American, Belgian and Portuguese capital, has been working petroleum in Angola since 1913. Over 400 tons of valuable drilling machinery have been imported from America, and bores to the depth of one mile have been made in the Alto Dande district near Loanda, and also at Ambrizette. The Acting Consul-General adds that as far as he can gather there is every indication of the existence of petroleum, but a spout has not yet been discovered.—(*Bd. of Trade J., Jan.* 17, 1918.)

Calcium Carbide in Japan.—The carbide industry originated in Japan with the establishment of a company at Koriyama, in 1901, the producing capacity of the company being only some 50 or 60 tons per month, but within a few months of the appearance of the Japanese article, the importation of American carbide was completely checked. A year or two later, as the general demand increased, another factory was established at Sendai, and shortly afterwards a third company was formed at Nagaoka, but the total output of the two companies did not exceed 60 tons per month. Within a short time, these three companies formed a syndicate by which they were able to control the output and sales, and thus retained for a period the monopoly of the trade. Competition, however, was inevitable, and a little later a considerable number of factories were established in quick succession, causing the syndicate to dissolve.

As the result of the establishment of these companies there has been a tremendous increase in the production of carbide in Japan, and an export business has been created. The manufacture of carbide was not, however, the sole object of some of the companies. The various hydro-electric power concerns, for instance, produced carbide, as they had spare power which could be utilised for the purpose. In addition to the established concerns several new carbide companies have recently been formed, and their factories are in course of construction. Further, some of the Portland cement manufacturers, attracted by the high prices which have been ruling recently,

are also producing carbide. This development will cease, however, when prices drop.

Owing to the enormous demand in Japan for sulphate of ammonia, and the consequent rise in prices, one Japanese carbide factory, with a capacity of from 25,000 to 30,000 tons per annum, is now concentrating its efforts on the production of sulphate of ammonia, the ammonia being made from calcium cyanamide produced from the carbide by the fixation of nitrogen drawn from the air. Another large company, with a total capacity of 5000 tons per annum, is also producing sulphate of ammonia by the same process. It is, in fact, very largely the diversion of carbide to the production of cyanamide that has brought about the present scarcity of carbide in Japan.
In Japan conditions are particularly favourable for the cheap production of carbide.

The cost of production prior to the war was from 3 yen to 3.50 yen per 100 lb. (yen = 2s. ½d.), but it has gradually increased during the past three years in consequence of the advanced cost of raw material and labour. At present, the average cost of production may be estimated at approximately 5 yen per 100 lb. In ordinary times carbide is shipped at from 80 yen to 100 yen per ton f.o.b., but the present price is more than three times as high, and even then it is difficult to obtain supplies. In 1917, before prices had mounted so high, a Japanese firm exported to Sydney a fairly large quantity of carbide at prices in the neighbourhood of £20 per ton c.i.f.

The export of carbide from Japan actually commenced towards the end of 1916, but the trade is severely restricted by the shortage of tonnage. The foreign trade is at present chiefly with Australia, the Philippines, Java, and some of the Indian ports. With a greatly increased output and the advantage of subsidised steamers, there is likely to be severe competition between the Japanese article and imports from Scandinavian and other countries in these markets after the war.—(*Bd. of Trade J., Jan.* 10, 1917.)

GOVERNMENT ORDERS AND NOTICES.

SPELTER (CONTROL) AMENDMENT ORDER, 1918.

An Order issued on January 22 by the Ministry of Munitions extends that made on March 23, 1917, and in future the word "spelter" will mean spelter of all qualities, and include sheet and rolled zinc, scrap zinc, hard spelter, dross, zinc ashes, flux skimmings, zinc dust, zinc ore, zinc oxide, zinc sulphide (or lithopone) whether dry, in oil, or prepared for use, and zinc compounds of every kind, or any of them.

TURPENTINE AND SUBSTITUTE CONTROL ORDER, 1918.

The Minister of Munitions has made the following Order, dated January 25:—

1. No person shall, on or after 25th January, 1918, until further notice, purchase or take delivery of any spirits of turpentine or any turpentine substitute, as hereinafter defined, now or hereafter situated in the United Kingdom, except under and in accordance with the terms of a licence issued under the authority of the Minister of Munitions, or of the Board of Admiralty, or of the Army Council; or sell, supply, or deliver any such spirits of turpentine or turpentine substitute to any person other than the holder of such a licence, and in accordance with the terms thereof; provided that no such licence shall be required by any person for the purchase and delivery of any such spirits of turpentine or turpentine substitute in quantities not exceeding an aggregate of five gallons during any one calendar month.

2. For the purposes of this Order the expression "turpentine substitute" shall mean mineral turpentine, white spirit, white oil, or any product of petroleum under whatever name sold or known (except motor spirit and benzine), capable of being used as a substitute for spirits of turpentine.

3. This Order may be cited as the Turpentine and Substitute Turpentine Control Order, 1918.

4. All applications for licences under this Order should be made to the Controller, Mineral Oil Production Department (M.P.S.), Ministry of Munitions, 8, Northumberland Avenue, London, W.C.2.

MARGARINE (REQUISITION) ORDER, 1918.

By this Order, dated January 17, margarine manufacturers are to place at the disposal of the Food Controller the whole of their stocks and all margarine produced by them, after January 26.

CATTLE FEEDING STUFFS (REQUISITION) ORDER, 1918.

(1) The Food Controller takes possession of all cattle feeding stuffs in the United Kingdom on January 22 from holders of more than 50 tons; (2) and of such which shall be made, produced or adapted for sale after January 21 (but not of oil cakes or meals to which the Oils, Oil Cakes and Meals (Requisition) Order, 1917, applies).

[Returns to be made to the Secretary, Ministry of Food, Palace Chambers, London, S.W.1.]

STATUTORY LIST.

Orders in Council of January 18 and February 1 amend the List of persons, etc., with whom trading is forbidden.

A supplement to the *Board of Trade Journal* (Jan. 24) contains a complete list of articles the import of which has been prohibited, not prohibited, or prohibited except under licence, by Royal Proclamations from Feb. 15, to Dec. 31, 1917.

ENGINEERING COMMITTEE.

The Minister of Reconstruction has appointed the following Committee to consider the provision of new industries for the engineering trades. The Hon. H. D. McLaren, Mr. Chas. Bennion, Sir G. Bullough, Mr. F. H. Crittall, Mr. R. Dumas, Mr. W. B. Lang, Mr. C. A. Lister, Mr. P. J. Pybus, Mr. G. H. Sankey, Sir P. Stothert, Mr. J. Taylor, Mr. W. Thom, and Sir W. Rowan Thomson. (A list of the duties of this Committee is given in the Bd. of Trade J., Jan. 31, 1918.)

PROHIBITED IMPORTS.

By a Proclamation, dated January 16, the undermentioned may not be imported into the United Kingdom except under licence from the Board of Trade: Antimony ore; antimony, crude and regulus; antimony sulphide.

PROHIBITED EXPORTS.

An Order of Council dated January 22 announces:—

(1) *That the following headings should be deleted from the list of prohibited exports:—*

(C) Algin and its compounds. (B) Asphalt. (B) Asphalt, coal tar. (B) Bitumen, liquid or solid. (C) Celluloid, articles wholly or partly manufactured of. (B) Ammonia and its salts, whether simple or compound (except ammonium nitrate, perchlorate, sulphate, and sulphocyanide). (B) Ammonia, liquefied. (B) Ammonia, liquor. (B) Ammonium alum. (A) Cinchona bark, its alkaloids and their salts. (C) Hydrastis canadensis. (B) Nickel, oxides and salts of (except nickel nitrate), and mixtures containing such oxides or salts of nickel. (B) Phosphorus and its compounds. (B) Sodium carbonate. (C) Sodium sesquicarbonate. (C) Cork and cork dust and articles manufactured from cork or cork dust. (B) Fustic (chips and extract). (B) Glue, osseine, and concentrated size, fish glue, isinglass, finings, and other kinds of gelatine. (C) Goods manufactured wholly or partly of leather, not otherwise prohibited. (C) Linoleum. (B) Logwood (chips, extract, and preparations). (C) Spirits, potable, of a strength of less than 43° above proof.

(2) *That the following headings should be added:—*

(B) Algin and its compounds. (A) Asphalt. (A) Asphalt, coal tar. (A) Bitumen, liquid or solid. (A) Celluloid, articles wholly or partly manufactured of. (B) Ammonia and its salts, whether simple or compound, and mixtures containing such salts (except ammonia liquor, liquefied ammonia, ammonium alum, ammonium carbonate chloride, nitrate, perchlorate, sulphate and sulphocyanide, and nickel ammonium sulphate, and mixtures containing such ammonium salts). (A) Ammonia, liquefied. (A) Ammonia, liquor. (A) Ammonium alum and mixtures containing ammonium alum. (A) Ammonium carbonate and mixtures containing ammonium carbonate. (A) Ammonium chloride, including muriate of ammonia and salammoniac, and mixtures containing these substances. (A) Cinchona bark, its alkaloids and their salts, and preparations of any of these substances. (C) Hydrastis canadensis and hydrastine. (A) Nickel ammonium sulphate and mixtures containing nickel ammonium sulphate. (B) Nickel, oxides and salts of (except nickel ammonium sulphate and nickel nitrate) and mixtures containing such oxides or salts of nickel. (A) Phosphorus and its compounds. (A) Sodium carbonate in all forms, including sodium sesquicarbonate and mixtures containing any of these substances. (A) Cork and cork dust. (C) Cork or cork dust, articles manufactured therefrom, not otherwise prohibited. (A) Fustic (chips and extract). (A) Glue, osseine and concentrated size (and other sizes and sizings made from glue), fish glue, isinglass, finings and other kinds of gelatine. (B) Goods manufactured wholly or partly of leather, not otherwise prohibited. (A) Linoleum. (A) Logwood (chips, extract and preparations). (B) Size and sizings of all kinds (whether nitrogenous or not), not including articles the exportation of which is prohibited to all destinations under the prohibitions attaching to farinaceous substances, dextrine, concentrated size and other size and sizings made from glue. (A) Spirits, potable, of a strength of less than 43° above proof.

The following may not be exported to prohibited destinations *even by sample post*:—

(B) Cobalt, cobalt ore and alloys of cobalt. (B) Molybdenum and molybdenite. (A) Photographic sensitive films, plates and printing paper, whether exposed or not. (A) Steel containing tungsten or molybdenum, and any tools or other articles made from such steel. (A) Steel and steel articles containing chrome cobalt, nickel, or vanadium. (A) Tungsten alloys. (B) Vanadium.

Samples of the following materials, whether of commercial value or not, may not be exported by *parcel post* or by *shipment* unless a Privy Council licence has been obtained. Samples of *no commercial value*, however, may be exported by *sample post* without licence or certificate.

(A) Aeroplane dope. (A) Aluminium, alloys of aluminium and manufactures of aluminium. (A) Aluminium powder. (A) Casein and preparations thereof. (A) Cerium and its alloys. (A) Diamonds suitable for industrial purposes. (A) Emetin and its salts. (A) Eucaine hydrochloride, eucaine (benzamine), lactate, and their preparations. (B) Ferro-cerium. (B) Ferro-chrome. (A) Ferro-manganese. (A) Ferro-molybdenum. (B) Ferro-nickel. (B) Ferro-titanium. (B) Ferro-vanadium. (A) Glass for optical instruments. (A) Glycerine and mixtures and preparations containing glycerine in excess of 1 per cent. (B) Iridium and its alloys, and manufactures containing iridium. (A) Mica blocks, mica sheets and mica splittings. (A) Neosalvarsan. (B) Nickel, alloys of nickel and nickel ore. (A) Novocain and its preparations. (C) Nux vomica alkaloids and their salts and preparations. (B) Osmium and its alloys, and manufactures containing osmium. (B) Palladuim and its alloys, and manufactures containing palladium. (A) Platinum, alloys of platinum, and manufactures containing platinum. (A) Platinum, salts of. (A) Radium and its compounds. (B) Rhodium and its alloys, and manufactures containing rhodium. (C) Rock crystal. (B) Rubber (raw, waste and reclaimed), solutions containing rubber, jellies containing rubber, and any other preparations containing rubber, and also balata, gutta percha, and the following varieties of rubber, viz.:— Borneo, Guayule, Jelutong, Palembang, Pontianac, and all other substances containing caoutchouc. (B) Rubber, gutta percha, or balata, goods, made wholly or partly of. (B) Ruthenium and its alloys, and manufactures containing ruthenium. (C) Santonin and its preparations. (A) Salvarsan. (B) Selenium. (A) Silk threads, yarns and twists of Tussah silk and of artificial silk. (A) Silk waste of all kinds (including artificial silk waste) and all threads, yarns and twists thereof, including noils and noil yarns. (A) Tantalum, alloys of tantalum and ores containing tantalum. (B) Thorium, oxide and salts of. (B) Tin. (B) Tungsten filaments for electric lamps. (B) Tungsten ores (including ferberite, hubnerite, scheelite and wolframite). (B) Tungsten compounds.

The destinations to which the goods in the lists are prohibited are indicated by the letters (A), (B) and (C) and are as follows:—

(1) Goods marked (A) to all destinations.

(2) Goods marked (B) to all ports and destinations abroad other than ports and destinations in British Possessions and Protectorates.

(3) Goods marked (C) to all destinations in foreign countries in Europe and on the Mediterranean and Black Seas other than France and French Possessions, Russia, Italy and Italian Possessions, Spain and Portugal, and to all ports in any such foreign countries, and to all Russian Baltic ports.

Manganese in Brazil.—The production of manganese ore in Brazil was 154,870 tons in 1912, 183,330 tons in 1914, 288,671 tons in 1915, and 503,130 tons in 1916. The average price in Rio de Janeiro in 1916 was above $14.00 per ton, and the total value 7.18 million dollars.

Sulphuric acid in the U.S.A.—According to the Bureau of Mines, 6,250,000 tons of sulphuric acid (50%) were used in 1916. Of this amount, 40% was made from Spanish pyrites, 5·6% from Canadian, 12·8% from domestic pyrites, 22·3% from smelter acid, and 19·2% from sulphur.

REPORT.

Mines and Quarries: General Report, with Statistics. 1916. *By the* Chief Inspector of Mines. Pt. III.—Output. [*Cd.* 8885. 3*d.*] *Home Office.*

The following table gives a general summary of the minerals produced in the United Kingdom, and of their values at the mines and quarries, during the year 1916:—

Description of mineral.	1916. Quantity.	1916. Value at the mines and quarries.
	Tons.	£
Alum shale	6261	704
Antimony ore	—	—
Arsenical pyrites	300	300
Arsenic	2,545	56,104
Barium (compounds)	76,034	127,491
Bauxite	10,329	2,934
Bog ore	1,095	274
Chalk	2,786,321	145,504
Chert, flint, etc.	50,592	11,650
Clay and shale	6,500,388	1,247,338
Coal	256,375,366	200,014,626
Copper ore	787	6,234
Copper precipitate	241	15,639
Fluorspar	54,731	18,697
Gold ore	1,338	650
Gravel and sand	1,961,650	200,414
Gypsum	219,284	73,183
Igneous rocks	4,843,176	973,874
Iron ore	13,494,658*	5,545,072
Iron pyrites	10,481	6,875
Lead ore	17,107	339,169
Lignite	500	375
Limestone (other than chalk)	10,541,573	1,395,830
Manganese ore	5,140	6,020
Natural gas	85,000 cubic feet	Not stated
Ochre, umber, etc.	10,159	9,933
Oil shale	2,009,232	1,032,294
Salt	1,960,448	904,133
Sandstone	1,999,308	596,617
Slate	176,827	471,401
Soapstone	301	404
Sulphate of strontia	2,513	2,639
Tin ore (dressed)	7,892	712,142
Tungsten ores	394	4 9,699
Uranium ore	51	1,001
Zinc ore	8,476	65,304
Totals	284,135,498	214,034,524

*Exclusive of 302 tons of micaceous iron ore, used for paint, and placed under the heading "ochre, umber, etc."

The quantities of coal and oil shale produced in 1916 were substantially the same as in 1915, but there was a considerable falling off in the amounts of alum shale, arsenical pyrites, bog ore, gold ore, lead and zinc ores, lignite, chert and flint etc., soapstone, and of igneous rocks; and to a lesser extent of gravel and sand, limestone, sandstone and slate. The most notable increases in the quantities mined occurred in the cases of strontium sulphate (449 %), fluorspar (65 %), barium compounds (57 %), and copper ore (36 %). The chief counties producing barium compounds are Salop, Cork, and Durham; copper ore, Cornwall; lead ore, Durham and Derby; zinc ore, Cumberland, Northumberland and Flint. Of the principal coal-producing counties, Glamorgan, Monmouth and Nottingham showed a noteworthy increase in production. Fife and Lanark in Scotland also increased their outputs, and the gain in Queens Co., Ireland (anthracite), was no less than 57 % at 16,492 tons.

Coal and coke.—Of the 256,375,366 tons of coal produced during the year 1916 the following amount was exported:—

	Tons.
Coal	38,351,553
Coal, equivalent of 1,481,498 tons of coke exported	2,469,163
Coal contained in 1,324,695 tons of manufactured fuel exported	1,192,225
Coal shipped for use of steamers engaged in foreign trade	12,988,172
Total	55,001,113

Leaving 201,374,253 tons of coal available for home consumption or 4·525 tons per head of the population of the United Kingdom. This figure is based on the estimated civil, military and naval population for the year 1916.

The percentage of the output of coal shipped abroad has been steadily falling since 1913; in that year it was 34·2, and during 1916, 21·5 per cent. Of the quantity of coal exported in 1916 France took approximately (in millions of tons) 17¼, Italy 5¾, Norway 2¼, Denmark 2¼, Spain 2, Sweden 1½, and the Netherlands 1¼.

During the past 44 years (1873—1916), the total value of the minerals raised amounts to over £4,000,000,000, of which coal accounts for nearly £3,500,000,000 (85 per cent.). In the same period 8,715,824,000 tons of coal were raised, of which 24·4 per cent. were exported or used for steamers engaged in foreign trade. The approximate average price per ton at the mines during 1916 was 14s. 11·7d. for England, 18s. 71·9d. for Wales, 15s. 3·69d. for Scotland, and 16s. 6·29d. for Ireland; and for the whole of the United Kingdom 15s. 7·24d.; in 1915 the average was 12s. 5·60d. Tables are given showing the tonnage of coal carried on the railways, *i.e.*, traffic received from collieries or places situated on the company's own system, and on the canals. The total amount conveyed by the latter was 7,863,287 tons. The total quantity of coal used in the manufacture of coke was 37,624,162 tons (compared with 35,579,231 tons in 1915), and of this, 8,100,889 tons were carbonised at gas works, and 13,288,474 tons in coke ovens.

Concerning the number and kinds of coking ovens used in the United Kingdom, out of a total of 16,320 (16,574 in 1915), no less than 6,892 or 42·2 per cent. were of the beehive type; the corresponding percentage for 1915 was 45·4.

The coal used in the manufacture of briquettes amounted to 1,760,717 tons (against 1,594,258 tons in 1915), of which 1,648,996 tons were of steam coal, 74,468 tons of household coal, 35,902 tons of coking coal and 1351 tons of other kinds.

Copper.—From the 1028 tons of dressed copper ore produced in 1916, 278 tons of metal were obtained. The imports were: 34,309 tons of ore, 43,839 tons of regulus, 2237 tons of old copper, 111,412 tons of unwrought and partly wrought copper, and 1582 tons of manufactured metal; and the exports: 20,289 tons of copper, 7335 tons of old and unwrought and partly wrought foreign copper, 1 ton of British and 1 ton of foreign copper ore.

Iron.—The following tables give the output of iron ore from mines and quarries, and the average price per ton (or the average percentage of iron recoverable) in the chief centres of production:—

County.	Quantity.	Price per ton.
*Under the Coal Mines Act** :—		s. d.
Northampton	139,239	2 10
Stafford (North)	701,722	12 6
York (North Riding)	4,315,765	6 5
Ayr	110,789	19 5
Lanark	70,652	20 6
Renfrew and Inverness	74,005	13 5
Under the Metalliferous Mines Regulation Act:—		Per cent. iron.
Cumberland	1,310,366	52·71
Gloucester and Glamorgan	89,199	37·51
Lancaster	297,949	52·16
From Quarries:—		
Leicester	670,654	27·89
Lincoln	2,897,376	24·76
Northampton	2,022,121	32·35
Oxford, Rutland	462,140	31·95

*Average per cent. of iron obtainable, 30.

6.933.767 tons of iron ore (exclusive of purple ore) were imported, chiefly from Spain, and 1100 tons of British ore, and 13 tons of foreign ore, were exported.

The following figures show the quantity of iron ore available for the furnaces of Great Britain in the year 1916:—

	Tons.
The total quantity of iron ore from mines and quarries in the United Kingdom	13,494,658
Foreign ores imported	6,933,767
"Purple Ore" or residue of cupreous iron pyrites, calculated at 75 per cent. of 949,996 tons of raw cupreous iron pyrites imported	712,497
Total	21,140,922
Less British and foreign iron ores exported	1,113
Total quantity of iron ore available for the furnaces exclusive of mill, forge, etc., Cinders used in some furnaces	21,139,809

Pig iron production, from iron ores of British and foreign origin:—

	1916.	1915.
Works in operation	115	118
Furnaces built	485	487
Furnaces in blast	294	289
Pig iron made	8,919,469*	8,723,560
Iron ore used (including cinder, etc.)	21,505,556	21,706,411
Coal used	2,612,543	10,300,888
Coke used	2,509,456	9,746,743

*918,158 tons exported.

The average prices per ton of pig iron were Cleveland No. 3, £4 14s. 6d. (quoted), £4 2s. 10d (ascertained quarterly); North-West Bessemer f.o.b. £6 7s. 10d., and of all kinds of pig iron exported, £8 2s. 3d.

Iron pyrites.—10,181 tons were obtained from mines, and 949,996 tons, chiefly cupreous iron pyrites, were imported.

Lead.—From the 17,107 tons of dressed lead ore obtained, 12,573 tons of lead and 85,165 ounces of silver were extracted.

Manganese ore.—Only 5140 tons were obtained in Carnarvon and Merioneth, but 440,659 tons were imported.

Oil shale.—The average yield of oil from Scotch shale was 20 gallons, and of ammonium sulphate 44 lb. per ton of shale. The average price at the mines was 6s. 10·33d. (5s. 6·98d. in 1915).

Petroleum.—451,556,152 gallons were imported (136,913,547 less than in 1915).

Mercury.—2,556,214 lb. were imported and 1,521,800 lb. exported.

Tin ore.—The amount of tin obtained from the 7892 tons of ore produced was 4697 tons. The average percentage from ordinary ores was 65. 33,912 tons of ore and 33,646 tons of tin were imported; 18,022 tons of British tin and 17,494 tons of foreign tin were exported

Tungsten ores.—354 tons 17 cwt. of tungsten ores, valued at £13,642, were obtained from mines and open workings in Cornwall, 30 tons, valued at £4500, from mines in Cumberland, and 9 tons 10 cwt., valued at £1557, from mines in Devon during the year 1916. The average percentage of metal contained in the dressed ore from Cornish mines was 61.

Zinc ore.—3000 tons of zinc were obtained from 8476 tons of ore mined in the U.K. 78,325 tons of zinc ore, 53,337 tons of crude zinc, and 3669 tons of manufactured zinc were imported, and 21,320 of crude and manufactured zinc were exported.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal, Jan. 24, 31, 1918.)

OPENINGS FOR BRITISH TRADE.

A manufacturers' agent at Rabat desires to get into communication with United Kingdom manufacturers and exporters of drugs who desire to do business in the Moroccan market, and who are not already represented at Rabat. [Ref. No. 19.]

A member of a firm in Porto Alegre (Brazil), who is now in the United Kingdom, wishes to get into communication with U.K. manufacturers desirous of being represented in Porto Alegre. [Ref. No. 24.]

TARIFF CUSTOMS AND EXCISE.

Argentina.—From January 22, export duties will be levied at the rate of 12 per cent. in the case of agricultural products, and 15 per cent. in the case of pastoral and other products, on the amount by which the valuations of the goods at the time of taking out the shipping permit (or permit to warehouse for export) exceeds the "basic prices" of various products. A special Commission is to fix the valuations, once a month, for the goods included in the schedule, and also the basic prices and valuations for other goods. The schedules of "basic prices," valuations, etc., include the following:—

			Valuation.			Rate of export duty.	
Per 1000 kilos.	Pesos Cts. (gold).		No.	Pesos.Cts.		Pesos.Cts.	
Quebracho logs	15	51	9	16	50	0	14·85
Quebracho extract	75	—	10	122	50	7	12·5
Linseed	62	71	13	66	93	0	50·6
Tallow and melted fat	166	98	18	320	80	23	07
Margarine and palmitine	—	17·20	27	0	38	0	03

A Decree probibits the importation of (I) substances for use in diagnosing, preventing, and curing diseases to which cattle are subject, without the previous authorisation of the "Direccion General de Ganaderia," and (2) such substances for use in treating cattle diseases, the existence of which in the Republic has not been officially ascertained. It is also prohibited to sell and use vaccines against cattle pest (carbunclo) unless such vaccines have been previously tested, and their efficacy verified by the National Health Department.

British India.—The exportation of carborundum, carbonado, and garnets has been prohibited to all destinations except the United Kingdom.

Ceylon.—The "Ceylon Government Gazette" of November 30, 1917, contains a copy of a Government notification to the effect that from and after December 1, 1917, the export duties on copra and coconut oil will be removed for a period of six months, provided that in each case the exporter can show to the satisfaction of the Principal Collector of Customs that he has not charged the seller with export duty, or, in the case of coconut oil, that the oil has been manufactured from copra, the seller of which has not been charged with the export duty.

Ecuador.—Among the alterations made (October 30, 1917) in the tariff classification and duties imposed are: Boot and shoe blacking, 34 centavos per kilo. gross; pharmaceutical preparations, not specially mentioned in the tariff, 68 cents if the formula is quoted, and 1 sucre 13 cents if unquoted (the latter require a special permit). Medicinal

preparations of cod liver oil, gypsum and all kinds of fireproof material for building purposes, are now free of duty.

France.—The French Customs Department notifies alterations in the classification for tariff purposes of the following substances:—Ferro-uranium, chrome-nickel alloys, perfumeries non-alcoholic containing saccharine, and other non-alcoholic perfumeries containing sugar.

Gold Coast.—The Board of Trade has received through the Colonial Office a copy of the "Export Prohibition (War) Proclamation No. 38" (No. 45 of 1917), which prohibits the exportation from the Colony of the under-mentioned goods to the extent specified below, viz.:—To all destinations except the United Kingdom, British Possessions and Protectorates, France Italy and Russia, except through Baltic ports: All oleaginous kernels, nuts seeds and products (except vegetable oils, cocoa, foodstuffs and feeding stuffs manufactured from oleaginous kernels, nuts, seeds or products), including castor beans, coconuts, copra, cottonseed, ground nuts, earth nuts or peanuts (Arachides), hempseed, linseed, palm nuts and palm kernels, poppy seeds, rape or colza seed, sesamé seed, soya beans, sunflower seed, and all other oleaginous kernels, nuts, seeds, and products. To all destinations except the United Kingdom: Palm oil. Notwithstanding the above prohibitions, it is provided in the Proclamation that such goods may be exported to such consignees in such countries and in such manner and quantity as may be permitted by the Governor.

United States.—The under-mentioned articles have been added to the list of goods for which export licences may only be granted for actual war purposes: Cottonseed, corn starch, peanut meal, soya-bean meal, copra, molasses, syrup, glucose, starch, and condensed, powdered, evaporated, or preserved milk of all kinds.

Netherlands.—The exportation of hops has been prohibited as from January 10, 1918.

South Africa.—Tariff Decisions (No. 26), dated November 22, 1917, issued by the Commissioner of Customs include the following:—Chrome alum (167), free; copal gum, if in bulk (126), 3 per cent. *ad val.* (rebate for the Empire: the whole duty); dyes for manufactures as specified (167), free; sodium sulphite (193), 20 per cent. (Empire rebate: 3 per cent. *ad val.*); tanning substances as specified (167), free.

COMPANY NEWS.

BRITISH OIL AND CAKE MILLS, LTD.

The shareholders of this company have been officially informed that the Annual General Meeting will be postponed owing to the difficulty in making up the accounts due to the recent action of the Food Controller in requisitioning the company's stocks. As the gross profits for 1917 are in excess of those of the previous year, the directors feel justified in declaring a further (final) dividend of 10 per cent. less tax, on the ordinary share capital, making 15 per cent. for the whole year.

The adaptation of the mills to the production of oils suitable for margarine is proceeding as rapidly as possible, and, in addition, the building and equipment on The British Extracting Company's property of a factory for the manufacture of margarine is being pushed with all speed. The directors have further decided to establish another margarine factory in the West of England. The Board has also under consideration a scheme for the better housing of their employees at Hull. Building operations are of course impossible during the continuance of the war, but the selection of a suitable site and its acquisition is now engaging the attention of the directors.

BRUNNER MOND AND CO., LTD.

In a circular letter to shareholders, dated January 26, this company announces that a special valuation of its assets has shown the existence of a surplus of £2,797,243, and it is now proposed to capitalise this amount together with a further amount of £1,849,561, part of the sum standing to the credit of the reserve fund, by increasing the capital of the company by £5,000,000, thereby raising the total authorised capital to £10,000,000. The directors further propose to allot to shareholders on the register on February 5, 1918, 4,646,805 fully-paid £1 ordinary shares, in the proportion of three new shares for every two so held, thus leaving a reserve of unissued capital for future contingencies. Fractional parts of shares will be allotted to the Secretary, who will sell them on the Stock Exchange and distribute the net proceeds among shareholders who were entitled to such fractions. In the opinion of counsel, the new shares will constitute capital, not income, and therefore they will not be subject to income tax or super-tax. The scheme has been submitted to H.M.'s Treasury.

Resolutions embodying these proposals were presented to an Extraordinary General Meeting of the company at Liverpool on February 5, and duly passed. A further Extraordinary General Meeting will be held on February 20.

BOOK REVIEW.

A SUPPLEMENTARY MEMOIR ON BRITISH RESOURCES OF SANDS AND ROCKS USED IN GLASS MANUFACTURE. *By* P. G. H. BOSWELL, A.R.C.S., D.Sc. *Pp.* 92. (*Longmans, Green and Co.*, 1917.) *Price* 3s. *net.*

Professor Boswell's early completion of his important survey will undoubtedly prove of considerable value to the glass industry of this country. An adequate knowledge of the home resources of raw materials is of the greatest importance to the industry, and there is now placed on record for the first time information as to the reserves of sand which are suitable for use in glass manufacture. Before the war excellent sand was imported in large quantities from Holland, Belgium, and France, and as it was mainly brought over in coal boats as ballast it could be obtained at low prices in maritime districts. The working of many of the occurrences of sand to which the memoir refers may be prevented by economic conditions, and it can be well seen from the sketch map marking the location of the chief resources of glass sand in relation to the glass-making areas that the utilisation of some of them will depend to a great extent on the provision of cheap transport by the systematic development of our inland waterways.

The most desirable property of a glass sand is uniformity of grain size, as an even grade is a most important factor in securing homogeneity.

It is doubtful if the heterogeneity caused by the use of badly graded, and therefore unevenly melting, sands can be altogether eliminated even by stirring. A glass sand should contain a high proportion of grains from 0·25 to 0·5 mm. in diameter; the presence of grains smaller than 0·1 mm. tends to the formation of fine "seed," which is difficult to remove in the "fining" stage of the melt. One of the conclusions to be drawn from this survey is that although we have not in this country any deposit equal in quality and extent to that at Fontainebleau, we have ample reserves of sands suitable for all ordinary glass-making purposes. A home supply of the comparatively small quantities of sand required for the manufacture of optical glass is of prime importance. Selected sands from the soft white quartzites of Muckish Mountain, in Donegal, contain less than 0·01 per cent. of iron oxide, and this source, although very inaccessible, may provide the requisite supply. Most of the sands used by the glass industry in America are obtained by the crushing of quartzite rocks, but for economic reasons crushed rocks are unlikely to become an immediate source of supply of any large quantity of glass sands in this country.

A great improvement can be effected in the quality of many sands by washing, and this method of treatment is now receiving greater attention from sand-pit owners. The extent to which the cleansing and grading may be improved by washing is indicated in tables (p. 64), the value of which would have been much enhanced if quantitative information as to the yield of washed sand had been included. The types of washers at present in use give a satisfactory result with comparatively coarse sands, such as those of Leighton Buzzard, but are much less efficient for finer grained sands of the Aylesbury type. Where an ample supply of water is available, the design of an efficient washer for fine grained sands should present no great difficulty. The introduction of adequate washing plants would be greatly facilitated by co-operation between the producers and users of sands for both glass manufacture and refractory purposes. Dry sieving is also a valuable means of grading a sand, especially for sands of low iron content, as the aluminiferous coating on the quartz grains is thereby retained to a great extent. The tendency of molten glass to devitrify is reduced and the toughness increased by the presence of alumina, and it has a further value in enabling larger proportions of sand and lime to be used with a consequent reduction in the cost of the batch.

The use of felspar as a source of alumina in a glass batch is extending, and an indication of the possibility of substituting the home for the imported material is provided by the author's survey of our resources of suitable rocks of low iron content. The falling off in the imports of felspar from Scandinavia gives increased importance to the provision of a home supply of this material, and it is unfortunate that the only known deposits of any extent are in such inaccessible situations. Only brief references are given to the uses of sand for its refractory properties and the foreshadowed memoir on our resources of refractory sands will be awaited with interest.

In the preface to this memoir attention is drawn to the advantage the glass industry of this country is likely to derive from the prescient policy of the Department of Optical Munitions and Glassware Supply of the Ministry of Munitions, and the memoir itself provides an admirable example of the department's efforts to enable the industry to cope both with the present abnormal conditions and the post-war conditions of trade activity and competition.

W. J. REES.

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CARBON ASSIMILATION. *A Review of Recent Work on the Pigments of the Green-leaf and the Processes connected with them. By* I. JORGENSEN *and* W. STILES. *New Phytologist Reprint. No.* 20. *Pp.* 180. *(London: W. Wesley and Sons)*

BRITISH RESOURCES OF SANDS AND ROCKS USED IN GLASS-MANUFACTURE: SUPPLEMENTARY MEMOIR ON. *By* P. G. H. BOSWELL, D.Sc. *Pp.* 92. *(London: Longmans, Green and Co.)*

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MINES STATEMENTS. *New Zealand.* 1915. *By the* HON. W. D. S. MACDONALD, *Minister of Mines, Wellington,* 1916.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No.* 7331. *Telegraphic Address*: *Induchem, Finsquare, London.*]

SOME APPLICATIONS OF COAL GAS AS A FURNACE FUEL.

H. HARTLEY.

The industrial activity resulting from the unprecedented efforts made to satisfy the demands for munitions has greatly stimulated the activity of the furnace manufacturer, and this is especially noticeable in the case of appliances designed for use with gaseous fuel. Transport difficulties and other troubles arising from labour shortage have directed the attention of the manufacturer requiring heat treatment appliances to the possibilities of coal gas as a fuel, and the gas industry has not been slow to take its opportunity.

Prior to 1914 it had been demonstrated in such industrial centres as Sheffield and Newcastle that town's gas, although initially dearer than coke or coal in terms of B.Th.U. available, could be used satisfactorily and, in many cases, more cheaply than solid fuel, for annealing, case hardening, tool heating, etc. The elimination of the necessity for fuel storage and coke and ash handling, together with the avoidance of stoking troubles and the possibility of increasing the output of the shops were, in all probability, the factors which tempted steel workers to put in experimental installations in the early days of the gas oven furnace. The real struggle on the part of the furnace designer then began in his endeavour to overcome the prejudice of the operator. The furnace was capable of performing the proposed operation satisfactorily, of that he was assured as the result of his own tests, and there gradually grew up groups of workers accustomed to carry out the various operations with that type of appliance. Thereafter industrial competition provided an ever-present stimulus towards development.

The oven furnace was the first type established, and before the war it was obvious to those engaged in its manufacture that there was an immense field for its application. Partial success had also been attained in the production of crucible furnaces capable of use, in industrial conditions, for the melting of non-ferrous metals, but the extent of their application in this country at that time was not such as to suggest the rapid development that has taken place in the last two years—a success in part due to the fact, mentioned above, that oven furnaces were in use which, although not as efficient as might be desired, were capable of satisfactory service, thus leaving the staffs engaged in this line of development free to concentrate on the metal melting problem. By the application of known facts it has been possible to design crucible furnaces capable of competing even in fuel costs with the majority of the coke-fired furnaces in use, perhaps largely owing to the inefficiency of the latter; but the concomitant advantages of the gaseous fuel furnace would commend it to many founders.

Metal Melting Furnaces.

Hitherto in this country one type of furnace has been developed almost exclusively, although it is probable that this will not much longer be the case. The furnace generally in use is of the crucible type heated by means of a gas and air blast. Originally the natural draught crucible furnace had been designed, but had not commended itself to the ordinary founder, although it met with some success in the industrial melting of precious metals. The blast type, which has superseded it, is capable of more rapid working and is more efficient.

In designing these furnaces the problems to be solved involved :—1. The attainment of an efficient transference of thermal energy to the metal through the pot. 2. The avoidance of undue volatilisation losses where these are liable to occur, and the production of a molten metal sufficiently free from gas inclusions and impurities retained chemically to be capable of producing satisfactory castings.

Considering first the thermal problem, the use of a crucible introduces complications, and gives rise to two different sets of conditions in the combustion chamber. In the transmission of heat, radiation, convection and conduction all play a part; the first two predominating in the transference to the pot, and the first and the last in the transmission of the thermal energy from the pot to the solid metal, while convection only plays a large part in the final stage of the transmission from the pot to the metal after liquefaction has occurred. Close packing of the pot and good contact between pot and metal are to be desired from the thermal point of view, but wedging of the ingots should be avoided as it may cause a splitting of the crucible when the metal becomes heated up. Probably the conductivity of all metals is sufficiently high to be without effect on the transference. Specific heat and melting point—or rather pouring temperature—are, of course, of prime importance, as they determine the number of heat units to be transmitted to each kilo. of metal. The pouring temperature also may become the predominating factor in determining the fuel consumption according as to whether it is near to or considerably below the maximum temperature attained in the combustion zone.

In the transference of heat from the combustion zone to the pot, the factors operative are better under control. It is desirable to have as much transmission as possible by radiation, which is not interfered with to an appreciable extent by the layer of "dead gas" adhering to the side of the crucible. On the other hand, however, as the main radiating source is the hot wall of the combustion chamber, loss of heat by conduction through the brickwork of the furnace has also to be remembered. Convection is increased by turbulence, and high speed of travel combined with it lessens the thickness of the relatively cool "dead layer," so that the space surrounding the pot is reduced to the minimum permissible. The extent of the dependence of the efficiency of the gas-fired furnace on the retention of the original size of the combustion chamber is generally recognised, although the influence of the capacity of this portion of the furnace may be controlled within limits by increasing the gas consumption. Reasonable attention to the condition of the chamber walls is desirable both on the count cited, and in order to obtain as long a life as possible for the firebrick lining.

It is self-evident that if the hot gases could be made to impinge on the metal itself a more rapid and efficient heating up would be obtained, and although there appear to be limits to this procedure, advantage has been taken of it in the preheating of the metal in the most efficient types of furnace made at present. The degree to which metal-preheating can be pushed is determined by the properties of the metal to be melted, and for this reason further knowledge is required concerning the ability of metals to absorb gases or to part with volatile constituents. It may be mentioned that many founders regard it as highly undesirable, when working with yellow brasses, to have any melting taking place in the preheater when there is intimate contact between the products of combustion and the metal. Preheating of the air and gases also improves results, both because a certain amount of energy is returned to the combustion chamber, from the waste products going to the flue, and, what is more important still, a higher

temperature is attained in the combustion zone, with a consequent increase in the rate of transfer of thermal energy to the crucible. This latter point is of special importance when it is desired to cast metals of high melting points. Commercially it has been found practicable to save 30% in the fuel bill by proper attention to preheating, and it is not unlikely that still further improvements will be effected thereby.

With regard to the second part of the problem, viz., the avoidance of excessive volatilisation losses and metal contamination, experience indicates that pouring temperature on the one hand, and the nature of the gaseous atmosphere in contact with the metal on the other, are factors of prime importance, whilst the duration of the melting process also must have an influence.

A consideration of the melting and boiling points of commercial copper-zinc alloys at once indicates that the percentage volatilisation loss will be greater in the case of those richer in zinc, other factors being equal, because with some of the latter the pouring temperature must almost coincide with the boiling point, whereas when the zinc content is lower the temperature range between the melting and boiling points rapidly becomes wider. Of course with a given brass the higher the pouring temperature the greater the loss of spelter. On the whole with the gas-fired furnace, which is more rapid in operation than the old type of coke-fired pit furnace, there is an appreciable decrease in the loss of spelter on melting.

There is little agreement, as yet, concerning the conditions which influence gaseous absorption, although it is generally conceded that absorption is mainly brought about by the molten metal, and increases rapidly with the temperature in the majority of cases. It is not always satisfactory to hold the metal prior to pouring, if it has been rendered too hot in the furnace, as a means of allowing the dissolved gases to escape.

The effect of the nature of the atmosphere has been investigated, but disagreement is marked and the variations from metal to metal seem to be great. Many workers seem to be of the opinion that carbon monoxide and nitrogen are not absorbed to a troublesome extent; if that is so, the current practice of covering brass with charcoal during melting must have a beneficial influence. The use of a cover of molten flux would probably be of assistance in the lessening of gas absorption, as it is to a small degree in lessening spelter losses.

Oven Furnaces.

For the most part these are worked under natural draught, or by means of low pressure gas and air, though the blast type has been developed for use where high temperatures are required together with rapid working. The greatest industrial application of town's gas is in the processes of annealing, hardening and case hardening. For many of these operations either the contact of products of combustion with the metal under treatment is not harmful, or the atmosphere in the furnace can be regulated so as to render it innocuous, with the result that the muffle furnace is not required. In fact for industrial operations the large coal-gas-fired muffle has not been developed, although the use of the small type in the laboratory is familiar to all. The operations already mentioned involve the maintenance of a given temperature for a relatively short period, with efficient control of that temperature. It is in virtue of these desiderata that gaseous fuel, which in terms of pence per 1000 B.Th.U. available is the dearer, has been able to oust solid fuel. The conditions of working depend to such an extent upon ability to effect temperature changes quickly that the town gas-fired furnace has been able to effect economies in fuel charges. On the other hand when longer periods are necessary for the heat treatment, as in the production of malleable iron, there are as yet only isolated cases in which a stand-by gas furnace has been found very useful for "rush" work.

Turning to the thermal problem it is apparent that the actual efficiency, calculated in terms of the heat units transmitted to the metal as a percentage of the total heat available in the fuel, will be determined to a considerable extent by the arrangement of the work in the oven and the load applied, factors which are in large measure out of the control of the furnace manufacturer. He is concerned, however, with constructing an oven which shall if possible be at a uniform temperature throughout the working space when hot, and at the same time allow the material inserted to be heated uniformly. It is also desirable that the furnace shall have as small radiation and convection losses as possible from the walls, together with a low flue loss. The percentage conduction losses through the walls will decrease as the size of the furnace increases for a given shape of oven, while at the same time increasing size will offer greater facilities for recuperation with a consequent lessening of the flue losses.

An analysis of the conditions affecting the conduction losses shows that starting with thin walls, an increase in the thickness of the refractory material at first produces a marked saving, but that the addition of successive layers results in a decreasing saving per layer. A thickness, dependent on the conductivity of the material and the temperature in the oven, is reached beyond which it is not economical to proceed. That such a condition exists will be realised when it is borne in mind that the loss is determined ultimately by the ability of the outside of the furnace to discharge heat, and that this is in its turn effected both by radiation and convection. The extent of the former varies as the fourth power of the absolute temperature of the exterior whereas the latter varies more nearly as the first power of that temperature.

Hitherto attempts to lessen the flue loss have been based on preheating of the air used for the combustion, the greatest success having been attained in furnaces which work with air applied at a pressure of a few inches water gauge by means of a suitable fan. This latter type of furnace was introduced a few years ago and having met with great success will probably be much developed in the near future. In it the coal gas is not mixed with the air prior to the point of combustion, but is burnt to give a luminous flame, which can be made to spread over the whole arch of the furnace. By proper attention to constructional details uniform temperatures result and in addition the gases inside the oven are at a small positive pressure. This has the advantage that the leakage in of cold air, due to loose fitting doors, etc., which may occur in natural draught furnaces, is avoided; in the natural draught type this leakage can often be eliminated by an intelligent use of the flue dampers. Even if the luminous flame type should be superseded, the use of an air supply under a low positive pressure is assured of a future, as it enables conditions to be standardised to an extent impossible with natural draught, and gives the designer much greater opportunity for effecting economies.

The maintenance of the present demand for coal gas for industrial purposes will, to a certain extent, depend on the attitude of those responsible for determining gas prices. If a great harvest is to be reaped in this field the cost of gaseous fuel, in terms of B.Th.U., will have to approximate more closely to that of solid fuel, as it must not be overlooked that many of the improvements introduced in coal gas-fired furnaces can be applied directly to solid fuel furnaces.

THE CONTROL OF INDUSTRIAL AND SCIENTIFIC INFORMATION.

W. Rintoul.

One of the essentials necessary to success in the industrial competition which is before us undoubtedly lies in improved organisation. Other factors also come into play, no doubt, such as natural resources, national characteristics and control of capital; but the possession of any or all of these without a sufficient degree of organisation will not constitute a guarantee of success.

The importance of organisation in industry cannot be too strongly emphasised at the present time, and the object of this note is to direct attention to one department common to all industries, in which organisation is of paramount importance. This department may be called the Intelligence Department, because its function is to collect and re-distribute information which may be of use in connection with the normal working or development of the industry in question. Its function is, in fact, to act as the memory of the concern and it must be able to supply to the executive of other departments clearly drawn-up statements of such facts or figures as are requisite for their guidance.

The information which it is the duty of this department to collect must be drawn from very varied sources and in almost any form. It may be collected from books, periodicals, dissertations, casual articles in popular magazines and in the daily press; staff reports on original work and on manufacturing experiences; analyses of costs, yields, plant output and of conditions affecting labour; as well as from reports by agents and customers and from many other sources. The daily correspondence of an industrial concern also yields an important harvest of information which is well worth conserving. It should be a fixed rule that all information of current value which comes into the hands of any department of such a concern should be passed to the Intelligence Department for record. In too many cases in the past, valuable information has been consigned to the limbo of the forgotten or by chance remembered, instead of being recorded under some definite system which would ensure its being brought forward for consideration at a time when it could be made use of with advantage.

It should clearly be realised that even in a concern of moderate size the volume of important information to be handled by the Intelligence Department will be such that it must be dealt with in a very special manner if useful results are to be obtained. It does not require a vivid imagination to picture the chaos which would reign in a department dealing with such a stream of raw material without the assistance of the most thorough organisation. It is not sufficient that the information shall be filed within the given space of four walls—it must, by some means or another, be reduced to a condition in which it is readily accessible and in which any item can at once be traced. As it reaches the department it may be looked upon only as potential knowledge, and it is the duty of the department to see that it becomes essential and available for all time.

The most difficult duty which falls to the lot of the Intelligence Department is the grading of the information into that which is of sufficient importance for record and that which is likely to be of ephemeral interest only. The information must either be kept or it must be discarded; no intermediate course is open and it would require a degree of omniscience not at present available to determine with certainty that some fact of apparently little interest to-day may not in time become all-important. The safest policy, of course, would be to record every item of knowledge that might conceivably be of use; but the cost of operating a system on this principle would be prohibitive. It is clear that a definite maximum of economical effect must exist between the proportion of information recorded and the cost entailed by the necessary work. Unfortunately there is no ready method of arriving at this optimum ratio and for the present, at least, it must be determined in an entirely arbitrary manner. It is probable, however, that at least 90 per cent. of the total useful information which reaches the Intelligence Department may be rendered permanently available at a moderate cost.

The next difficulty to be faced is the selection of the most readily appreciable method of filing the collected information. Perhaps the best solution of this difficulty is the adoption, as the main guide to filing, of the mechanical form in which the information is presented; that is to say, whether as a book, a periodical, an extract, a patent, a typewritten document, or a manuscript, without any reference whatever to the subject to which the information in question relates. This method of filing possesses the great advantage of compactness and in most cases the economical use of the space available is an important consideration.

Assuming that such a method of filing is adopted, a reliable index becomes a necessity. It is the common impression that no great degree of skill or experience is necessary for the construction of a satisfactory index, but this idea is entirely fallacious. On one occasion some five individuals, all of whom were experts in some other division of knowledge but with no past experience of indexing, attempted to construct such an index. After some months of work it was found that so many contradictory decisions had been made that much confusion had already been introduced, and it was realised that in a very few years' time the index would be so complicated as to be unworkable. It was therefore decided to study more carefully the various systems which heve been proposed from time to time, with the object of selecting the one best adapted to meet existing conditions. The carrying out of even this decision was, however, by no means an easy matter because of the difficulty of appreciatiug the points of the different systems from a written description of them without having actual experience of their use. The best test, namely, that of handling an actual example constructed according to each system until familiarity in its use had been obtained, was not possible, because such indexes are by no means common. After due consideration of various systems, however, the choice finally lay between that adopted in 1905 by the "Institut International de Bibliographie" of Brussels and that proposed by J. Kaiser in his monograph on "Systematic Indexing," published in 1911. For any of the larger compilations of knowledge, such as the International Catalogue of Scientific Literature, or for a large library where the contents are handled only by the Library Staff, Kaiser's system would be too complicated, especially in that part of his system which makes use of related terms. Undoubtedly in such a case, the Brussels system would be preferable. When the range of interest is not too diffuse, however, and where the occasional user of the library system has to be provided for, the balance of advantages is certainly with the Kaiser system.

It would occupy too much space to attempt a detailed description of this system here, but it may be said that it is a card system in which concrete terms are used as the main guides, followed by sub-guides relating to geographical position and to process. These three items appear at the top of each card, the concrete term being in the left-hand, the geographical term in the

middle and the process term at the right. The body of the card contains an epitome of the information to be found in the original, and this is followed by a reference which enables the original article to be consulted directly, should this be necessary.*

The experience gained in constructing and handling an index of 150,000 cards during the past five years has led to the opinion that it admirably fulfils the object for which it was designed. The information recorded in it is readily available, not only to the members of the indexing staff who are handling it, but also to the occasional user who is willing to spend the short time necessary to enable him to understand the system upon which the index is constructed.

It may be added that, in addition to the main purpose for which it exists, the index has proved itself of great value in connection with industrial research. In very many cases when an investigation is under consideration, and before a definite decision to proceed with it can be arrived at, it is necessary to prepare a preliminary report on the state of present knowledge on that particular subject. In this connection the index can play a most important part if the essential information has been recorded, because the required information is already in a concentrated form and can either be epitomised or expanded with the minimum amount of labour. It also proves useful in many unforeseen ways. It allows of a rapid review of any particular field in which the industry may be interested, it possesses a marked value as a source of suggestions for future development and research and assists in the control of the policy underlying the selection of subjects for research. It is not too much to say that an index of this nature constitutes one of the most important instruments of research available at the present time.

OFFICIAL NOTICES OF THE SOCIETY.

The Council has accepted the cordial invitation of the Bristol and South Wales Section to hold the next annual meeting at Bristol. The Senate of the University has generously placed its buildings at the disposal of the Society for the occasion.

PROPOSED ASSOCIATION FOR REFRACTORIES RESEARCH.

The provisional committee appointed to draw up a scheme for a proposed association for refractories research has now drafted a preliminary prospectus in which is outlined a suggested constitution for the proposed association. In drafting the prospectus the committee has been in consultation with the Department for Scientific and Industrial Research, and it now proposes to lay the scheme before a selected number of firms and individuals interested in the subject and likely to become members of the proposed body. The Council of the Society of Chemical Industry has been asked to assist the provisional committee by furnishing it with the names of such firms and individuals; and this notice is inserted in order that any members of the Society who desire to attend a semi-public meeting (to be called later) for the purpose of deciding upon the formation of the association shall send in their names to the General Secretary of the Society as soon as possible.

* "The Card System Series" by J. Kaiser. Vol. 1: "The Card System at the Office." (London; Vacher & Sons, 1908.) Vol. 2: "Systematic Indexing." (London and New York: Pitman & Sons, 1911.)

THE PROFESSION OF CHEMISTRY.

A further meeting of Associates and Fellows of the Institute of Chemistry in Yorkshire, Durham, etc., was held at Leeds on February 9 (confined on this occasion to those elected before July, 1917), to initiate an active policy of opposition to the new regulations set up by the Council of the Institute, under which large numbers of diplomas have been granted to candidates without examination, contrarily, as the objectors hold, to the provisions of the Charter of the Institute. Mr. F. W. Richardson, of Bradford, presided.

At the outset the Chairman intimated that it was proposed to put the subjoined prel minary question to the meeting, and it was formally proposed to do so by Mr. B. A. Burrell (Leeds), and seconded by Mr. C. J. H. Stock (Darlington):—

> "Does the meeting approve of the action of the Council in granting the diploma of the Associateship without examination to some hundreds of men other than students or accepted candidates of the Institute prevented by war from taking the final examination in due course, without having proved by examination the professional ability of these men in accordance with the requirements of the Charter, and of the Institute's invariable practice hitherto?"

Prof. J. W. Cobb (Leeds) submitted that a "resolution" to which no amendment could be submitted was out of order and irregular. Others supported this objection, and Mr. W. McD. Mackey (Leeds) further objected on a point of fact—that it had not been "the invariable practice hitherto" to admit no member without examination, and that one instance was within his personal knowledge.

This led to considerable discussion, in which the accuracy of Mr. Mackey's statement was denied (as concerning the Associateship) by the Chairman and Mr. W. G. Young (Doncaster); and the procedure was defended on the ground that the question to be put was a question simply, and not a "resolution" or motion. Its sole object was to clear the way, and if, the Chairman said, there was an affirmative vote on the question it would mean that the meeting approved the action of the Council, and any further object of its promoters would be rendered nugatory. Mr. Gawler (Leeds) raised still another point, which, he said, made it difficult for him, and no doubt others, to vote on the question—viz., that while the action of the Council might be held by some to be illegal, it might in the view of others be desirable—as being in line with a needful reform of the Charter—so that at the best any vote must be a "muddy" one. Dr. R. D. Abell said that the official reply to an almost similar question sent up from Manchester had been to the effect that the conditions of admission were printed on the form of application, that in every case the conditions had been complied with, and that every election had been by unanimous vote at a well-attended meeting. Mr. Stock pointed out that as regarded the older members there was a clear question of principle involved, since, apart from men engaged in war service, there had been admissions of men who were not eligible in their sense of the term.

Prof. Cobb further pointed out that according to a statement by Mr. Pilcher, the Council had taken legal advice, and that what had been done was strictly in agreement with the charter; to which the Chairman rejoined that to set against this view there was the uniform action of the Institute over a long series of years and also the question of desirability now.

Eventually it was agreed to abbreviate the question by terminating it at the word "Institute." It was then put to the meeting and by show of hands 12 declared against the action of the Council

and 6 in favour, while 3 did not vote. It was further agreed to communicate formally this result to the Council in detail.

Capt. Foster then read the following compound resolution proposed to be submitted :—

> That this meeting shall address a letter to every Fellow now proposed for election to the new Council of the Institute, and to those put forward by provisional local sections, asking, for the information of members, whether he undertakes to urge the following programme on the Council if elected :—
>
> (1) That the Council shall not confer the Associateship on any person who has not previously passed the final examination prescribed for this professional diploma in Article 4, clause (3), except, for the period of the present war, on students of the Institute who have passed the intermediate examination, or accepted candidates for the final examination and only then on such as have served or are serving with H.M. Forces, or are engaged on war work to the Council's satisfaction, and prevented thereby from taking the final examination.
>
> (2) That until June 30, 1921, any person of good repute holding a degree in science from a British University, with chemistry and physics as two subjects in the final examination, who subsequently to taking this degree has been engaged to the approval of the Council for three years or more in the exercise of "the profession of analytical and consulting chemistry," or as a "public or technical analyst or chemical adviser," shall be eligible for the Fellowship without professional examination in accordance with our Charter (Article 5, clause 2) and on admission shall pay, in addition to the regular entrance fee and subscription for Fellows, the amount of the regular entrance fee for the Associate final examination.
>
> (3) That otherwise than as provided in Section 2, the Council shall not admit persons direct to the Fellowship without professional examination, except such as are beyond doubt in no need of our Institute's authoritative qualification for professional advancement and profit, and whose pre-eminence in chemistry is so far above question that the dignity and public importance of our Institute are enhanced by such admission.
>
> (4) That the Council of the Institute be asked to obtain approval of two-thirds of the members by postal vote before embarking on any innovation regarding diplomas.

After a very protracted discussion, sections (1), (3) and (4) of the resolution were each approved by slightly varying majorities, and section (2) by the casting vote of the Chairman. These therefore constitute the "programme" to be submitted to candidates for election on the new Council; and it was further resolved as follows :—

Moved by Mr. Rhodes, seconded by Mr. Slatter :—"That a list of Fellows be now selected who are willing to serve on the Council, and to carry out the requirements of the foregoing resolution, and that this list be submitted to all members of the Institute as desirable candidates to be substituted for any of the Fellows now appearing on the voting list for the Council election who decline to comply with our requirements."

Moved by Mr. Stock, seconded by Mr. Burrell :—"That a fund of £50 be raised to defray expenses of correspondence, etc., and to authorise solicitors to prepare a case for submission to the leader of the Chancery Bar, Mr. Upjohn, K.C., for his opinion on the validity of the election of Associates without examination."

It was also agreed that a new sectional area be formed, to include Yorkshire, Lincolnshire, Durham, and Northumberland, to be known (provisionally) as the North-Eastern Section."

NATIONAL ASSOCIATION OF INDUSTRIAL CHEMISTS.

As far back as June, 1917, preliminary steps were taken in Sheffield to bring into being a national association to further the interests of chemists engaged in industrial undertakings. Contrary to the widely prevalent rumour that this body was merely a "trade union," one of the principal objects of the founders was to promote some organisation which would put a stop to the imminent adhesion of a considerable number of industrial chemists to real "trade unions," and this step was taken as much from the point of view of the employer as from that of the employed. Since the inception of the association its original objects have remained intact (with the elimination, however, of the word "benefits"), but the qualifications for membership have undergone considerable alteration. The objects are now defined as follows :—(A) The economic, intellectual, and social advancement of industrial chemists and metallurgists. (B) To promote the interests of its members by collective action. (C) To further the interests of young chemists entering on professional and business careers. (D) Education.

The qualifications, as revised in December last, are :—*Full Members.* Applicants, male or female, must be at least 21 years of age and have at least one of the following qualifications (summarised) :—(i.) They must have studied chemistry or metallurgy for at least 3 years in an approved university, technical college, etc., and obtained the degree or diploma, or (ii.) They must have been employed for not less than three years in a chemical or metallurgical laboratory, and be able to furnish satisfactory evidence of possessing an adequate knowledge of inorganic or organic chemistry, or metallurgy ; *or* (iii.) Any person, not possessing one of the above qualifications, may be admitted if, in the opinion of the Elective Body, he or she holds other qualifications considered satisfactory. *Associate Members.* Males or females of at least 16 years of age, who are engaged in industrial laboratories, are eligible for associate membership, if they can show that they are working to qualify for full membership.

Members will be grouped in Local Sections, each of which will have its own Council, and the latter will elect representatives on the National Council, which in its turn will elect a supreme executive body—the National Executive Council.

From a speech delivered by the President, Mr. A. C. J. Charlier, in September last, it appears that the first step in the policy of the Association is to obtain by legitimate means due recognition of the works chemist in the industrial life of the nation. One method of effecting this will be to see that he obtains representation on Government Industrial Committees which are now composed mainly of employers and members of the various Trade Unions. A second method will be to use every legitimate means to ensure adequate financial remuneration. Further, every assistance will be given to chemists who make discoveries and effect improvements to enable them to obtain just recognition of their work ; and an Employment Register will be opened.

It is understood that Local Sections have been formed in Sheffield, London, Birmingham, Middlesbrough, Newcastle and Scunthorpe, and that the number of members is approaching four figures, including many with academic qualifications.

We deeply regret to announce the death on February 21 last of Mr. Thomas Tyrer, the Hon. Treasurer of the Society. Apparently in good health, he was engaged at the Society's Offices on the previous evening, but early next day succumbed to a sudden heart attack induced by bronchitis. The last ceremony took place at Golders Green on February 25 in the presence of a large gathering of relatives, friends, workpeople, and members of this Society.

NEWS FROM THE SECTIONS.

NEW YORK.

On January 18 an ordinary meeting was held in the Rumford Hall of the Chemists' Club, under the presidency of Mr. Jerome Alexander, the Chairman of the Section, the members and guests present numbering 164.

The programme of the evening consisted in the presentation of the Perkin Medal to Auguste J. Rossi for his work on titanium steels. After an address by the Chairman, Dr. F. A. J. Fitzgerald, past-president of the American Electrochemical Society, gave an account of the life work of Mr. Rossi, and pointed out how he had held to his ideals through years of trial until his process was finally adopted.

Dr. W. H. Nichols, past-president of the Society of Chemical Industry, made one of his characteristic and interesting speeches, and concluded his remarks by presenting the medal of the Society.

Mr. Auguste J. Rossi, in acknowledging the medal, gave a brief sketch of his life since coming to America, and described how he became interested in the application of titanium to the manufacture of steel.

EDINBURGH.

The fifth ordinary meeting of the Section was held on February 12, Mr. J. Rutherford-Hill being in the chair. In opening a discussion on filtration, Dr. H. E. Watt referred briefly to the use of centrifugal machines, then described the construction and *modus operandi* of pressure filters as used in modern factories, reserving most of his attention to a detailed account of the mechanism and use of filter presses. These fall into two main types according as they are built up of recessed plates or flush plates and distance frames. The distinctive feature of the former is a raised rim which projects above the drainage surface on both sides of the plate ; presses of the latter kind have plates of which the faced joint surfaces are almost flush with the drainage surface, the chambers being formed by frames having faced surfaces corresponding to those of the plates and placed alternately with them. The speaker also described the process of lixiviating the filtered material, and pointed out that thorough extraction can only be effected if the wash water is distributed uniformly over the whole surface of the solid cakes, and if these are homogeneous and of the right thickness. Filter presses are usually constructed of cast iron, but in cases where this is inadmissible, wood, gunmetal, bronze (tinned and untinned), aluminium, xylonite or antimonial lead may be used.

For dealing with materials that require to be maintained at a temperature above or below normal during the whole time that filtration is being carried out, filter presses with jacketed plates are available. The plates are cast with a hollow interior and passages communicating therewith so that steam, hot water or cold brine may be circulated through them for heating or cooling the press.

Presses may be filled by means of a pump, but it is greatly preferable to use compressed air, particularly in the case of large units. The charge to be dealt with is run into a Montejus or " forcing receiver " which is in direct connection with the press. Air is forced in by means of a compressor and the charge enters the press, while filtration proceeds until the chambers are full of solid matter, as indicated by the fact that liquid is only dropping slowly from the outlets. The great advantage of compressed air is non-fluctuation or steadiness of pressure which conduces to the formation of a homogeneous cake. Some operators make the mistake of employing too high a pressure for charging, but it is better to take more time and employ a moderate pressure only, as otherwise the cake may be made too compact or forced too hard against the cloths, and washing rendered difficult. " Time = pressure " is a good empirical formula to bear in mind.

An interesting discussion followed in which the following took part :—Messrs. Merson, Romanes, Kirkcaldy, Allan Smith, Porritt, Luff, Walker, Kemp, Lauder, and Thomson.

In opening the discussion on " The Handling and Transport of Corrosive Liquids," Mr. B. D. W. Luff remarked that the problems which arise in dealing with such liquids afford a striking instance of the difficulties involved in converting laboratory experiments into industrial practice. The various types of containers, including mild steel drums, tank waggons, glass or earthenware carboys, were enumerated, and the methods of emptying them briefly referred to. The advantages of designing plant in such a way that each successive stage of the process is carried out at a lower level than the preceding one should not be lost sight of, as the elevation of liquids at frequent intervals is uneconomical. The use of the suction pump, centrifugal pump, the injector, the acid egg operated with compressed air, and the modifications of the latter known as the automatic elevator for raising liquids were described, and the provision of suitable piping, valves and stopcocks, for maintaining connection between various parts of the plant, were dealt with briefly.

In connection with the removal of fumes evolved during the transport of corrosive acids, the speaker discussed the use of fans for ventilation, and of some typical acid-resisitng cements for use in joining up earthenware pipes used as fume ducts.

In conclusion, reference was made to some of the more important resistant materials in general use, including fused silica ware, earthenware, lead-lined iron, glass-enamelled iron, aluminium, and finally the silicon-iron alloys introduced in recent years under the names of Tantiron, Narki, Ironac, etc., which are now assuming increasing importance in the chemical industries. It was further emphasised that the choice of the most suitable material for use depends not only on the resistance it offers to a particular liquid but also upon its ability to withstand mechanical wear and tear and its amenability to treatment in the hands of the constructional engineer.

In the discussion which followed (which was taken part in by Messrs. Adam, Grant, Romanes, Watt, Merson, and Kirkcaldy), the speakers gave their experiences with the use of acid liquids in the various industries with which they were connected. The corrosive action of dilute solutions of acids, of acid-laden vapours, and of substances not generally considered as corrosive (*e.g.*, mixtures of alcohol and water vapour), were also dealt with.

BIRMINGHAM.

At a meeting of this Section held on February 14 at the University, Dr. E. B. Maxted read a paper embodying some of his researches on nitride formation. In the first part he dealt with the formation of ammonia from nitrogen and hydrogen, pointing out that the thermodynamical study of the equilibrium between ammonia, nitrogen, and hydrogen at high temperatures showed the existence of some evidence that the equilibrium ammonia content first sinks with increasing temperature, then passes through a minimum, and finally rises again. All the formulæ at our disposal for the calculation depend on very small differences in the temperature coefficients of the specific heat of ammonia on the one hand, and of nitrogen and hydrogen on the other. Accordingly, considerable discrepancies are obtained in the numerical values of the calculated equilibrium ammonia content at such high temperatures, and these discrepancies vary with the specific heat measurements which are accepted as correct; but such reversal in the value of the equilibrium ammonia content with increasing temperature is shown in any case. Experiments were undertaken to investigate the yields of ammonia obtainable firstly by the sudden cooling of nitrogen-hydrogen mixtures injected into rapidly cooled flames, and secondly from a rapidly cooled high tension arc. By the first of these methods, working with flames burning under water, yields of ammonia were obtained which amounted, for atmospheric pressure, to over 1 per cent. by volume of the nitrogen-hydrogen mixture taken for the synthesis. This result is of especial interest inasmuch as such a yield cannot be obtained catalytically without the use of a high pressure. The results obtained by rapidly cooling a high tension arc burning in nitrogen-hydrogen mixtures are to be reported later.

In the second part of the paper, the possibility of synthesising iron nitride directly from iron and compressed nitrogen was discussed, and experiments were described showing that the dissociation pressure of iron nitride, just above its decomposition point, is higher than 200 atmospheres. A pressure furnace, which has proved of great general utility for the study of reactions at high pressures between gases and solids, was described and illustrated.

Dr. Morrell, who presided, complimented the author on his candour in describing his successes as well as his failures, and asked if any explanation could be given of the catalytic behaviour of iron in facilitating the union of nitrogen and hydrogen.

Mr. W. Patterson made some interesting remarks on the work he had witnessed in Prof. Haber's laboratory in 1905-6 when his process was in the initial unsuccessful stage.

Mr. E. C. Rossiter considered that the presence of oxygen in the iron catalyst would have a considerable influence on the decomposition of the iron nitrides. Experimenting some years ago he was able to get the oxygen content down to 0·2 per cent.; but in any case it should be easily possible to obtain a pure iron with less than 1 per cent. of the gas.

In his reply, Dr. Maxted said it was known that only those metals which formed unstable hydrides were capable of activating hydrogen. If iron hydride had been stable, iron nitrate would be formed when the metal was present in the formation of ammonia. In answer to Mr. Carter, he thought that the formation of ammonium salts in the cooling water was probable.

Prior to the reading of the paper, Dr. Morrell presented Mr. F. R. O'Shaughnessy, the Hon. Secretary of the Section, with a valuable testimonial on behalf of the members of the Section, as an appreciation of his services in organising the Annual Meeting of the Society last year.

PERSONALIA.

Sir J. J. Thomson has been appointed Master of Trinity College, Cambridge.

Dr. S. Rideal has been elected President of the Society of Public Analysts.

Prof. F. S. Kipping has resigned from the Advisory Committee of British Dyes, Ltd.

Mr. J. Gray, Vice-President of the Society of Chemical Industry, has been elected Vice-Chairman of Messrs. Lever Bros., Ltd.

Dr. J. Gordon Parker has become adviser to the Board of Trade on the conditions and requirements of the leather trades during the period immediately following the war.

The death is announced of Dr. E. A. Letts, formerly Professor of Chemistry at Queen's University, Belfast, and author of many researches on the disposal of sewage including "The Pollution of Estuaries and Tidal Waters" for the Royal Commission on Sewage Disposal.

Dr. R. S. Willows, Head of the Physics Department at the Sir John Cass Technical Institute, London, has been appointed head physicist in the laboratories of Messrs. Tootal Broadhurst, Lee & Co., of Manchester, in connection with their scheme for cotton research.

Prof. W. D. Bancroft, of Cornell University, is serving as technical adviser in the U.S. Bureau of Mines at Washington.—(*Science*, Jan. 11, 1918).

Prof. T. B. Johnson, of the Sheffield Scientific School of Yale University, has been awarded the Nichols Medal for research in organic chemistry. The medal is given annually by the New York Section of the American Chemical Society for the best original communication published in the Society's Journal.—(*Science*, Jan. 18, 1918.)

OBITUARY.

J. P. REMINGTON.

With John Price Remington passed away one of the foremost workers in the field of pharmacy. He was born in 1847 in Philadelphia where he graduated in pharmacy in 1866, becoming master of pharmacy a few years later. From 1867 he worked in the industrial branches of his calling, abandoning them when appointed to the chair of pharmacy in the College of Pharmacy, Philadelphia, in 1874, from which time until his death in January last he remained in close association with that institution. Widely known as a successful and inspiring teacher, Professor Remington enjoyed a still greater reputation as a contributor to pharmaceutical literature. His "Practice of Pharmacy," of which the sixth edition has recently arrived in this country, and his work as chairman of the Committee of Revision of the U.S. Pharmacopœia (1901—18) were undoubtedly the two outstanding achievements of his career; but he was also active in many other directions. Among the many posts of distinction he filled were those of president of the Seventh International Pharmaceutical Congress in 1893, and president of the pharmaceutical section of the Eighth International Congress of Applied Chemistry in 1912. Remington's connection with the Society of Chemical Industry dated from 1904, the year when the annual meeting was held in the United States. Those members of the Society who were present on that occasion still retain a lively recollection of his genial and hospitable nature, and a vivid memory of a charming personality.

MEETINGS OF OTHER SOCIETIES.

THE FARADAY SOCIETY.

The meeting of the Faraday Society, on February 14 at Manchester, was the occasion of a general discussion on electric furnaces. Prof. C. A. Edwards presided, and the discussion was preceded by the reading of a group of papers :—" Applications of Electric Furnace Methods to Industrial Processes," by H. Etchells ; " Electric Furnaces for Steel Refining," by J. Bibby ; and " Electric Furnace Control," by A. P. M. Fleming and F. E. Hill. The discussion turned largely on the electrical problems concerned in the operation of electrical furnaces, but in this report attention will be drawn more particularly to points of general chemical interest that arose out of the proceedings.

On the whole it may be said that more attention has been paid in the past to electrical design than to metallurgical considerations. The result is that the efficiency of the furnace has almost reached the maximum possible, and it is now beginning to be realised that power considerations—cheap water supply, high power factor, etc.—have perhaps played too great a part in the development and choice of electric furnaces. Whatever the cause, metallurgists in this country have not responded to their opportunties as they have elsewhere, although since the war a remarkable improvement has to be recorded and the large imports of Swedish iron and steel formerly considered essential to maintain our high-class products no longer figure in our returns. Extended use of electric refining will enable us to utilise inferior ores now neglected and cause our enormous deposits of phosphoric ores to be a great source of pure steel, and perhaps too of phosphates for fertilisers. Mr. D. Campbell strongly emphasised this point.

It is thought by some that the maximum size of the electric furnace will not exceed a 30 hp.-hr. capacity, although this view is disputed. Even this size, however, in view of the great currents employed—up to 20,000 ampères—is necessitating the consumption of a large quantity of electrodes, as these cannot be made in very large sizes. To meet this requirement and to introduce the advantage of a bottom electrode, by means of which the vertical currents that flow increase the circulation of the metal, Mr. J. Bibby has devised an ingenious furnace and an arrangement of transformers by which the usual 3-phase current of the supply system is transformed to current of 4 equal phases in balance.

The general principles on which are based methods of electrically controlling furnaces so that the temperature can be regulated accurately and quickly, were formulated by Messrs. Fleming and Hill, whose paper will be found very useful by those who desire to familiarise themselves with the way in which electric furnace installations have to be planned. According to Mr. Peck a cheap step-by-step regulator that can operate at full load is still awaited by the user of these furnaces. A word must be said on the oscillograph records exhibited by Mr. Etchells, showing typical wave-forms of the voltages taken at the terminals of the various types of furnaces in use. Time did not permit these to be discussed, but when they are published they deserve close study.

Two of the most interesting problems of the electric furnace centre round the electrodes and the refractory linings. The consumption of the former is often a heavy item in running costs, although it was stated that in the Snyder single-phase furnace the consumption is as low as 6 lb. per ton of steel. Mechanical design can help considerably here, in Mr. Mercer's view. Too much cold air enters by the doors of many furnaces and the apertures through which the electrodes pass also cause an avoidable consumption. More attention should be given to the electrode-feeding gear. The tilting adopted in some furnaces to ensure circulation is a crude device from the point of view of either electrodes or refractories, although systems of multiple electrodes will help to counteract this defect.

It cannot be said that the refractory problem has yet been solved, particularly with regard to the roof of the furnace. As pointed out by Prof. W. G. Fearnsides, at present acid materials (usually silica) must be used on account of the corrosive action of the gases and this is a serious limitation. The lack of a perfect refractory likewise limits temperature conditions, for the roof cannot be fully utilised as a distributing agent for the intense heat of the arc ; perhaps zirconia would be useful in this connection.

The types of furnaces chiefly in use in this country are arc furnaces :—the Héroult, Electrometals, Greaves-Etchells, and Snyder. The induction furnace is now employed to a very limited extent. Its chief drawbacks are low power factor, and the fact that the slag is bound to be at a lower temperature than the bath. In a new type referred to by Mr. Etchells, the Parker furnace, broken electrode material placed in a trough round the furnace hearth is used as the resister material. No figures were given.

A paper by Mr. E. A. Coad-Pryor and Dr. W. Rosenhain, on a subject somewhat auxiliary to the main object of the meeting, described a new type of high-temperature resistance laboratory furnace designed for the study of special refractories, which may conceivably develop into a furnace suitable for industrial needs.

WEST OF SCOTLAND IRON AND STEEL INSTITUTE.

At the fifth meeting of the session held on February 15 in the Technical College, Glasgow, with Mr. H. Beard in the chair, Dr. C. H. Desch submitted a report in the form of a lecture on " Improvements in the Puddling Process." The history of the process from the old type of hand-puddling furnace to the latest stage of mechanical appliances was treated at length, and then the activities of the Puddling Research Committee were described. The lecture was followed by a paper on " Some Useful Testing Machines," by Mr. J. S. Glen Primrose, in which several new types of machine were described. A particular form of universal machine for tensile compression and other tests was stated to be unique in that the same hydraulic pressure system was used both to apply the load and to measure the variations of stress exerted. A new form of French machine for determining the hardness of metals by direct indication instead of measurements and calculations was illustrated and described as very quick, accurate, and convenient, even in unskilled hands.

ROYAL SOCIETY OF ARTS.

A very large number of members and guests attended on February 14 to hear Sir H. Ledgard, late President of the Upper India Chamber of Commerce, read a paper on " The Indian Hide and Leather Trade."

Although the British Empire yields the largest quantity of light hides and skins in the world, the British tanner in the main devotes himself to the tanning of heavy hides imported from South America, Italy, France and other countries. Hides from the Argentine are in better condition than those obtained from India, as in the latter

country the bullocks are largely used for cultivating the land and their hard life of toil is recorded on the skins in sores, scratches, scars or other disfigurements. In spite of this drawback, the leather made from Indian hides (East India "kips") is the best in the world for making the upper parts of Army boots and strong boots for labourers. The Home Government has recently recognised this fact, has commandeered the output of "kips," and is trying to induce tanners in this country to build new factories for their treatment. The Indian hide export trade ranks fifth in value of the products of India, standing before that of tea. According to a recent census return, there are about 220 millions of cattle, including buffaloes, and 80 millions of sheep and goats in the country.

The export trade comprises the hides or skins tanned in India, and the raw hides or skins exported and tanned abroad.

Of goatskins, India, before the war, exported annually some 20 million pieces in the raw state and 7,500,000 tanned. The United Kingdom took most of the latter, but about half the skins were re-exported to the Continent, and America took about one-third of the remainder. Of the raw skins, America imported direct about 75 per cent., the U.K. 10 per cent., and Germany practically none. Since the war the U.S. imports have risen to 88·5 per cent., and ours have dropped to 8 per cent. or less. Of sheepskins the export in the raw state prior to the war, was 2,200,000, and about 9 millions tanned. America took 87 per cent. of the raw skins in 1913-14, and 96·5 per cent. in 1915-16. The figures for the tanned skins in the same years were: U.K.. 58·9 and 64 per cent.; U.S.A., 20·9 and 19·8; Japan, 15 and 11·8 per cent. Of buffalo hides about 160,000 pieces were exported to England in the tanned state, and about 2 million pieces raw, and of the latter about half went to enemy countries, one-third to the U.S.A., and the remainder to the U.K., Holland and Italy.

Before the war about 27 per cent. of the ox and cow hides (the most important branch) was exported, mainly to this country, in the tanned state, and over 70 per cent. went to the Continent, *i.e.*, chiefly to Germany, as raw hides. At one time all the hides came here and "kip" tanning was a most important industry, the Leeds district alone turning out about 3 millions per annum. In 1872 the shipments to the United Kingdom were 7 millions. To other countries none. Ten years later, in 1882, 5 millions came here and 1 million went to the Continent. By 1892 the figures were almost reversed, for 1,038,417 came to this country, and 4,423,159 went to the Continent. For about three years longer our imports held up, and we averaged about 1¼ millions against 5 millions to the Continent. In 1896 we dropped to 681,000. Imports continued to dwindle, until in 1913 we imported only 17,530 as against 6,981,947 to the Continent and 261,060 to America.

The author then described the methods of curing and preparation in use, remarked upon the classification of the hides for trade purposes, and indicated the uses to which hides and skins from various localities were best adapted.

Before the war about three millions of cow, ox and calf hides were yearly tanned in India and exported, but owing to the help of the Indian Government and the efforts made by the tanners in the Madras and Bombay Presidencies—the chief centres of the tanning industry—the present production of Indian tanned ox and cow hides is fully double that of the pre-war output. The tanning material chiefly used in the Presidencies mentioned is the bark of the *Cassia Auriculata*, a jungle shrub, commonly known as tarwad, and in Sir H. Ledgard's opinion no tanning material excels it for producing softness and pliability in the leather. In the large and up-to-date factories of the Cawnpore district the chief tanning materials employed are *Acacia Arabica* or babul, and *Terminalia Chebula* (the myrabolam nut). Chrome tanning is carried on to a small extent, and in this direction there are great possibilities.

Sir H. Ledgard then dealt at length with the methods employed by Germans to gain control over the export trade, and with the means of combating this evil in the future. The present position is that although the Indian Government has employed only British and Indian agents for purchasing hides on Government account, some of the old ring firms of enemy origin, or their successors, are lurking in the background ready to pounce upon the trade directly peace is declared.

THE CERAMIC SOCIETY.

At a meeting held at Stoke-on-Trent on February 9, a paper by H. S. Newman on "Graphic Representation of Ternary Mixtures" was first communicated by title, and then Mr. J. M. Draper read a paper entitled "Brief Notes on Hydraulic Separation as applied to the Treatment of Fine Coals, Shales, and Clays."

By hydraulic separation is understood the separation of mineral particles by taking advantage of the different velocities of fall in water of grains of equal size but of different specific gravity.

An hydraulic separator, which has been modified recently for dealing with the finer sizes of coal, was described in detail, and it was stated that from a mixture of equal weights of bituminous coal (sp. gr. 1·27) and steam coal (sp. gr. 1·33), the size of grain being $\frac{1}{64}$ in. and the velocity of the water current about 4·5 in. per sec., the separator delivered 56 per cent. of the mixture with a sp. gr. of 1·28, and 44 per cent. with a sp. gr. of 1·32. The difference of specific gravity between coal and shale, or between coal and clay, is much greater than that between the coals above mentioned.

The process has been applied to other colliery purposes. At one colliery a plant is delivering about 1500 tons per month of pure fine coal into by-product coke ovens, giving a superior coke. The shales removed are quite free from coal, and become available for brickmaking.

The author considers that the simple apparatus described, which does not require skilled attention, can be made available for removing many of the impurities from clay.

Dr. J. W. Mellor next read a paper on "The Deterioration of Moulds during Storage." When partially-used moulds are stored a fur often appears upon them and this is analogous in mode of growth and in general characteristics to the scum which develops in the drying of ware which has been made with water contaminated with certain soluble salts.

Analyses show that the fur or scum contains soluble salts, and that the salts are partly derived from the solution of plaster itself in water, and partly from the accumulation of soluble salts derived from the clays that were used in the moulds.

The author then discussed at some length the nature and origin of the salts contained in the fur, and finally summarised the precautions to be observed to prevent the deterioration of moulds during storage. Moulds should be dried as rapidly as possible, and should never be stored in a damp condition. The store room also should be dry and if practicable, warm, otherwise condensation of atmospheric moisture may occur. Such surface condensation, although harmful, is attended with less serious results than storing in a partially dried state, for the furring caused by it does not necessarily indicate a deteriorated internal condition.

NEWS AND NOTES.

AUSTRALIA.

Arrangements are being completed at Botany for the immediate erection of a large works for the manufacture of gelatine, glue and size. About £15,000 is being expended on the buildings and £20,000 on plant and machinery. It is expected that the products will be put on the market in May next. The capacity of the new factory will be adequate to permit of the Australian company capturing the whole local market; hitherto most of the materials have been imported from the United Kingdom (1,400,000 lb. yearly).

The Royal Commission on State (Queensland) Iron and Steel Works appointed June 8, 1917, has reported to the effect that immediate steps should be taken to establish a State smelting plant for the prodnction of pig iron and of testing in bulk the iron ore deposits of the State.—(*Bd. of Trade J., Feb.* 7, 1918.)

CANADA.

Advices from Nova Scotia state that the returns of the principal products for last year are as follows:—Coal $23,600,000, coke and by-products $5,000,000, gold and other minerals $250,000, gypsum, limestone, etc., $1,250,000, building materials and clay products $450,000, iron and steel products $20,000,000, fisheries $10,092,000, manufactures, ships and freights $17,750,000, products of the farm $36,117,203, products of the forest $4,500,000, game and furs $500,000. Total $149,509,203.

The Commissioner of Northern Manitoba, in his report on the mineral resources of that territory, states that Northern Manitoba unquestionably has mining resources that only await development to yield immense returns. The known mining area is in the region of a chain or series of lakes and rivers stretching easterly from Lakes Athapapuskow, Schist and Flin Flon, near Manitoba's western bonndary, to Herb or Weknsko Lake, a distance of approximately 90 miles. The former is reached from The Pas, *via* the Saskatchewan River, through Cumberland and Sturgeon Lakes, and the latter is 11 miles from the Hudson Bay Railway. In the former district immense deposits of copper sulphide ore have been discovered, and in the latter, veins of gold-bearing quartz, which have prodnced remarkable assays and are now beginning to yield good returns.

In an article on Canada's coal problem in the "Monetary Times," Mr. White, Consulting Engineer of the Canadian Conservation Commission, urges the development of Canada's coal resources, and gives the extent and position of the supplies. Nova Scotia has over ten and a half billion tons of bituminous coal, New Brunswick 161,000,000 tons. Ontario has a small quantity of lignite. The Western Provinces have many billion tons of lignite, and Alberta has, in addition to lignite, 845,000,000 tons of semi-anthracite, 218,000,000,000 tons of bituminous, and nearly a thousand billion tons of sub-bituminous. British Columbia has nearly eighty billion tons of bituminous coal. In addition to lignite and sub-bituminous coal, there are reserves in Canada of 313 billion tons of bituminons, and 845,900,000 semi-anthracite coal, although a small part of this, lying in remote and frigid regions, may not be available. The peat bogs of Canada are estimated to produce twenty-eight billion tons, equal in fuel properties to sixteen billion tons of good coal

SOUTH AFRICA.

There is every likelihood of a new industry being established in Natal for the pnrpose of extracting oil from cloves brought down from Zanzibar and other East African ports.

Among the many substances and substitutes which have come into prominence during the war is Berry Wax. This is a South African product derived from the covering layer of the fruitlets of the wax bnsh (*Myrica cordifolia*). The plant is grown as a sand binder in South Africa in the neighbourhood of Cape Town, Port Elizabeth, and other places. It is largely grown on Government land, and each year the Government calls for tenders for plucking the berries during the summer months. The wax was previously exported to Germany and was used in gramophone manufacture and also in the manufacture of floor polish. It is said to make an excellent polish. One firm in Cape Town is said to collect 10—15 tons of the wax per annum, the price being abont 10½d. to 11d. per pound. If there were a considerable demand for this wax, it conld probably be obtained in much larger quantities.

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One of the many urgent problems which have arisen in Sonth Africa since the outbreak of the war has been the discovery of a suitable disinfecting and oxidising agent to take the place of permanganate of potash, which, owing to the cutting off of supplies of potash salts from Germany, is now only obtainable in very small quantities at prohibitive prices. It is noted with satisfaction that a well-known Sonth African firm of chemical manufactnrers recently erected a plant for the production of chloride of lime, the demand for which is proving so insistent that the firm in question, in order to meet the situation, has taken steps to utilise temporarily its gold chlorination plant for the pnrpose. By this means the company has succeeded in supplying the most pressing needs, pending the erection of the special plant necessary for the production of the material on a larger scale. The new plant has been designed to supply the whole of the estimated requirements of South Africa, and the successful production of this important commodity from materials obtained wholly within the Union marks a further step in the industrial development of the country.—(*S. Afr. J. Ind., Nov.*, 1917.)

GENERAL.

Scheme for Chemical Publications.—The want of good chemical bibliographies in the English language has been felt for a long time past. Hitherto, the German publications have had the field to themselves; but these, quite apart from national considerations, have not proved satisfactory to English-speaking chemists, for they are incomplete in regard to the literature which is not German, and the references they contain are made to the Chemisches Zentralblatt which few English chemists have the opportnnity to consult. These publications do not give anthors' names, hence preventing reference to other series of abstracts. A provisional committee has recently been formed to remedy this deficiency by arranging a scheme for the publication of comprehensive bibliographies in English dealing with inorganic, organic, and physical chemistry and for issuing revision volumes periodically. No new bibliography will be undertaken if another dealing with the same branch of the subject is already in course of preparation in the English language. The Acting-Secretary of the Committee is Mr. F. W. Atack, 88, Claude Road, Chorltonville, Manchester.

Davy Faraday Research Laboratory.—The trustees of the late Dr. Ludwig Mond have anticipated their undertaking to pay to the Royal Institution the endowment sum of £62,000 before the year 1926 by transferring it to the managers now, thereby increasing to a considerable extent the income available for promoting chemical and physical research work. Some 24 years have now elapsed since Dr. Mond handed over to the managers of the Institution the freehold of the house adjoining it in Albemarle Street, and undertook to defray all the expenses necessary to convert the premises into a research institution equipped with the most modern instruments and appliances. The Laboratory was opened by King Edward, then Prince of Wales, in 1896, and has been fulfilling the objects of its generous founder ever since.

Government Aid for the Dye Industry.—According to the political correspondent of the *Manchester Guardian* (Feb. 14), the Government plan for securing the British dye industry after the war is practically settled, and will be announced in Parliament in the near future. The manufacturers suggested that the assistance should be given in the form of remission of the tax on excess profits, but the Treasury demurred. The plan decided upon is to grant loans for extensions of plant, with full security and on the principle that national capital must be used for national work. Further, subsidies will be given to assist the production of dyes especially difficult and costly to make; and grants will be made in aid of chemical research. There is another proposal to the effect that the Government should control the importation of dyes for a limited period after the war in order to prevent dumping.

British Patents in War Time.—Some uneasiness having been displayed recently in the public Press on the danger to this country caused by the patents being freely published, and thus information about valuable inventions getting to Germany, it is desirable to give a short statement of the facts of the case.

By an Order in Council of October 14, 1915, the Comptroller received power to delay the acceptance of any complete specification, and prohibit the publication of any invention contained therein, where he was satisfied that such publication might be detrimental to the public safety or to the defence of the realm, or might otherwise assist the enemy; and he was empowered to consult the Admiralty and the Army Council on the exercise of his powers. Since then, large numbers of patents have been kept secret in accordance with this order. Not merely are the Army Council and the Admiralty very strong on this point, but the Ministry of Munitions is continually sending its experts to the Patent Office to look through all the applications, to see if there be any that would be useful to their Department, or should be kept secret in this way. No persons in Great Britain are allowed to apply for a patent on any subject in any foreign or colonial country without first getting the consent in writing of the Comptroller, or of notifying him in writing and waiting one month for his consent. There are, it is true, a considerable number of patents on bombs, aeroplanes, and other war-like implements and machinery published from time to time; but these are probably in all instances inventions which the various Departments have carefully considered and declined. During the last two years no one has been allowed to send out of the realm the published specifications of any patents issued during the war without getting a special permit for this purpose.

Vitamines in War-time Diets.—This was the topic of a recent lecture given by Miss E. M. Hume of the Lister Institute at University College, London. Among the deficiency diseases to be feared at the present time, rickets, beri-beri and scurvy are the more important. Fresh milk, butter and codliver oil are the best available preventives of rickets, and for children, butter should be chosen in preference to margarine. Beri-beri develops when the diet consists too largely of over-milled cereals and super-heated (tinned) foodstuffs. It occurred in Gallipoli and Mesopotamia, among white troops, on a diet consisting mainly of white bread and meat, partly tinned and partly fresh; Indian troops were protected from it, because their ration included wholemeal and peas, beans or lentils. Scurvy became rife among Indian troops in Mesopotamia when fresh vegetables failed; white troops were protected by their large daily rations of fresh meat which most Indian soldiers refuse to eat. Indian troops could be protected against scurvy by the germination of the lentils or peas served out in their ration, for after 24 hours' germination such lentils are as valuable as fresh vegetables. Dried vegetables have always been found useless against scurvy, and commercial lime-juice seems to be equally impotent. A few cases of scurvy developed in the spring of 1917, in the northern towns of England, at the time of the potato shortage, but they disappeared when the new crop came on the market. When cow's milk has been heated or dried, or if starchy foods have been added, its anti-scorbutic property is diminished and orange juice should be given with it to infants. Failing orange juice, a larger dose of raw swede juice is an efficient substitute.

Japanese Enterprises in China.—The Electrochemical Industry Co., of Tokyo, has installed a plant at Fushan for the production of carbide, sulphate of ammonia, and other chemical products. It was thought that the manufacture of sulphate of ammonia would reach 7000 tons per annum, but lack of sufficient machinery limited the output to 4000 tons. The business, however, was most remunerative. The sulphate of ammonia was expected to sell for about $62·50 (gold) per ton, but the price has reached $150 per ton, owing to the heavy demand in Java and Japan and to the shortage of the European supply. Although Japan consumes large quantities of sulphate of ammonia, it produces less than 3000 tons per year. In the Osaka and Kobe districts alone the sales of ammonium sulphate last year exceeded 7000 tons. The market for this article therefore justifies the plans that are being made in Manchuria to produce it in large quantities. The annual demand in Java is said to be nearly 100,000 tons.

The South Manchuria Sugar Manufacturing Co., controlled by Tokyo financiers, has been capitalised at 10,000,000 yen and has constructed a large refinery at Mukden. The farmers in this district are being encouraged to grow sugar-beets, and the success of the enterprise seems to be assured.—(*U.S. Com. Rep.*)

New Vegetable Dye from Corea.—As the result of investigations conducted at the Central Laboratory of the Government-General, it is stated that the dye "Shinnamu," obtained from the leaves of a species of maple tree, has attracted attention. In the vicinity of Kaijo (Song-do) a large quantity of leaves is available and the manufacture of the dye on an adequate scale is being planned. Also there has been experimental planting of the species of the maple tree referred to, which is peculiar to Corea, being found nearly everywhere in that country. Samples of yarn dyed with this material can be inspected at the Department of Overseas Trade (Development and Intelligence), 73, Basinghall Street, E.C.—(*Bd. of Trade J., Feb.* 7, 1918.)

The Coal Famine in Russia.—The intimate connection between industrial welfare and fuel

supply is now being brought home to the Russian people. Between March 14 and August 14, 1917, no fewer than 568 industrial establishments in European and Asiatic Russia were closed down owing to lack of coal and raw material, involving the discharge of more than 100,000 workmen. Of these numbers, 63 factories and 4552 workers were in the Petrograd district, and 71 factories and 45,372 workers in the neighbourhood of Moscow. The cotton factories suffered most, losing 49 factories and 53,417 workers, and in the metallurgical industries 91 works were closed down and 10,802 workmen discharged. Excessively high rates of wages also acted as a contributory cause. The railways have been supplied with coal chiefly from the Donetz basin, but the supply from this source fell to 42 per cent. of the normal in August last. Nor is any relief to be expected by substituting wood or oil fuel. At the end of October, only 10 days' supply of coal was available for the railways, the output for that month from the Donetz basin being 69,000,000 poods (1000 poods = 16 tons) as compared with 105,000,000 poods in October, 1916. The *Russkaja Wolja* is of opinion that the increase in wages paid to the miners is an important factor in the reduced output from the coal mines. The output of coal per miner fell from the pre-war standard of 833 poods per month to 644 poods during the first half of 1916, and to 482 poods in the same period of 1917.—(*Z. angew. Chem., Nov.* 11, *and Dec.* 25, 1917.)

Fodder Substitutes in Germany and Sweden.—It has been ascertained by experiments that dried wood-pulp cellulose is quite suitable for cattle food when mixed with molasses and albuminous substances. Some of the largest cellulose mills in Sweden are making energetic preparations for turning out large quantities of the fodder in the spring, and the yearly output is expected to be about 20,000 tons. A high official in the Swedish Board of Agriculture states that its nutritive value is greater than that of hay, and that about 75 per cent. of it is digestible. The manufacture of straw fodder in Germany is now an important industry. In Sweden its production is curtailed owing to the scarcity of soda lye used in the process of manufacture. Reindeer moss and Iceland moss are now extensively used for fodder in Sweden, and experiments in the use of rushes as food for horses have met with satisfactory results. Heather has of late been coming more and more into use as a fodder substitute, and if prepared from slender sprays of the plant it is particularly useful for feeding horses. Leaves of various trees, particularly birch trees, are now being used as fodder in Sweden; and in this country new areas have been planted with rape, both for the production of oils and fats and for the manufacture of cattle cake. Quickgrass, after drying and chopping, is devoured eagerly by pigs, and these animals are also found to thrive on dandelion roots. One method employed is to boil the roots together with quickgrass before use. A strong food for cattle is prepared in Germany from glue, and another from yeast.—(*Bd. of Trade J., Jan.* 24, 1918.)

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U.S. Government Cyanamide Plant.—A very large cyanamide plant is being erected at Mussels Shoals, Sheffield, Ala., and it is estimated that the cost will exceed the $20,000,000 appropriated by Congress for nitrate plants. It will probably be the largest of its kind in the world and it is hoped that the output will be sufficient to meet all Government demands.—(*Dec.* 31.)

Pyrites in the U.S.A.—In the absence of sufficient quantities of Spanish pyrites for the manufacture of sulphuric acid, Secretary Lane announces that five mines have been started in the Southern States (Northern Georgia to Central Alabama), yielding 400 tons a day, to be increased to 1000 tons per day in a month or two.—(*Dec.* 17.)

Conservation of Grease Waste in the U.S.A.—It is estimated that 200,000,000 lb. of soap-making material and 8,000,000 lb. of glycerine are wasted annually in 25 cities of the U.S.A. Great efforts are being made to stop this waste, and a systematic survey of every town of over 10,000 population is being made with a view to utilising the garbage. —(*Dec.* 24, 1917. *Oil, Paint, and Drug Rep.*)

Export of Dyes from the U.S.A.—Despite the ever-growing demands of the home market, and the handicap caused by munition manufacturers drawing more and more on available supplies of coal-tar products, exports of aniline dyes continue to expand. The value exported during July, August and September last was $1,173,439, of which $497,106 worth was shipped in July: at this rate the annual exports would be valued at $4,693,756, or practically twice the value of the entire domestic production for 1914, when prices, however, were much lower. During the three months ending September 30 last, England was the largest importer of American coal-tar dyes, having taken goods to the value of $195,195, followed by British India, $184,967; Canada, $161,581; Spain, $105,504; France, $86,379; Japan, $80,073; Mexico, $75,353; and Italy, $67,484. The U.S. is the only country that has succeeded in establishing since the war began a successful dyeing industry capable not only of meeting domestic requirements, but also of exporting considerable quantities to allied and neutral countries.—(*U.S. Com. Rep., Dec.* 6, 1917.)

U.S. Dye Manufacturers and the Freight Problem.—Owing to shortage of freight the dye industry has received a severe blow, manufacturers having been ordered to restrict their output to urgent domestic demands and to cease producing for exportation. The possibility of using motor trucks for short hauls (*i.e.*, up to 100 miles) is being seriously considered, and some tests have already been carried out. It is believed that the cost of such transport will not greatly exceed the average railway charge per 100 lb. over the same distance and that any increased cost will be counterbalanced by the quicker delivery.—(*Oil, Paint and Drug Rep., Dec.* 31, 1917.)

Pottery in the U.S.A.—The great decrease of imports, and the virtual stopping of supplies from Germany, together with the prosperous home conditions, accounted for the great activity in the pottery industry during 1916. The value of all domestic pottery marketed in that year was $48,217,242, an increase of nearly 30 per cent. over the previous year, sanitary ware showing the largest increase (39 per cent.). Out of the 37 States producing pottery, Ohio stands first with a production valued at $19,441,533, or 40 per cent. of the total. Only 3 States—New Jersey, New York, and Pennsylvania—produced all kinds of ware. For the first time, efforts were made to obtain statistical information concerning chemical stoneware and chemical porcelain. The production, valued at $1,054,061, was confined to 8 States, of which Ohio was the first and New Jersey the second, and these two States produced 80 per cent. of the whole. The total of all imported clay products showed a decline in value of $1,034,222, and was the lowest for 30 years, except in 1890. The value of the exports increased by 79 per cent. over 1915, and amounted to $4,855,530 of which Canada took over 50 per cent. England took wares, mostly firebrick, valued at $635,599.—(*U.S. Geol. Surv.*)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Nitrogen Fixation.

Replying to a question put by Mr. Robinson in the House of Commons, Sir W. Evans said that it was the fact that important developments had been made in Allied and neutral countries in the fixation of atmospheric nitrogen, and considerable supplies of the products are becoming increasingly available. It is believed that enemy countries are now relying entirely on this source of supply for the production of their explosives. Arrangements have been completed by the Ministry of Munitions for similar production on a large scale in this country and it is probable that, in order to save tonnage, and owing to the length of the voyage from Chili, it will be found necessary to develop this policy still further. This source of supply is also expected to be of great value after the War for the production of fertilisers. —(Feb. 14.)

Petroleum.

In answer to Mr. Chancellor, Sir W. Evans stated that no boring for oil has been carried out in the United Kingdom.—(Feb. 18.)

Brewing.

In a written answer to Mr. D. Millar, Mr. Clynes gave the following quantities of materials used during the year ended September 30, 1917, Malt, 28,620,800 bushels; rice, 61,200 cwt.; maize, 6,200 cwt.; sugar and its equivalents, 1,613,700 cwt. The number of standard barrels of beer brewed for consumption in the U.K. during the calendar year 1917 was 16,133,800.—(Feb. 19.)

Tungsten.

Mr. Kellaway, answering General Croft, stated that no tungsten ore had been exported since its control was established in September 1915, with the exception of small quantities to France and the United States. He could not give any information regarding the period prior to the date named.—(Feb. 20.)

Edible Fats.

Mr. Clynes stated in reply to Mr. Kennedy that he was aware that the fats now commandeered by the Order of January 2, 1918, were formerly imported into Ireland in other forms. The importation of margarine into Ireland has been restricted in order to effect economies in transport. In answer to Sir G. Touche, he said that the relative importance of the national requirements for margarine and propellant explosives had been settled between the Departments concerned. The output of margarine will not interfere with glycerine requirements.—(Feb. 20.)

Linseed Oil.

Sir G. Touche asked the Parliamentary Secretary to the Ministry of Food if, when the soap-makers' stocks of oil and fat which were capable of being converted for edible purposes were commandeered for the production of margarine, soap-makers were given to understand that they were to be allowed prior claim on the stocks of linseed oil; and whether this understanding has been observed.

Mr. Clynes: Certain quantities of linseed oil are being allotted to soap-makers in place of the oils and fats commandeered from them for edible purposes, but no understanding such as that referred to in the question was ever entertained or arrived at with the soap-makers.—(Feb. 20.)

Sugar.

As a result of several questions addressed by General Croft to the President of the Board of Agriculture, Sir R. Winfrey gave the following information concerning the attitude of the Board to a possible beet sugar industry in this country. The Board of Agriculture is amply satisfied that the growth of sugar-beet of good quality is possible in this country. To collect data regarding the commercial prospects of the manufacture of sugar from sugar-beet the Government has provided funds for the purchase of an estate at Kelham in Nottingham through the British Sugar Beet Growers' Society, which estate will provide a site for the factory and grow a proportion of the beet required. The Board has made itself responsible for the cultivation of this estate, and the work of cleaning and preparing the land for intensive cultivation is already in progress. The beet sugar factory at Cantley has been closed during the war. It is doubtful if a factory can be erected at Kelham during the war, but a stock of seed is being procured for future use.

General Croft also asked questions of the President of the Board of Trade relating to the production of sugar in other lands, and in reply thereto the President informed him that in 1903, the year when the United States granted a preferential rate to Cuban sugar, the sugar produced in Cuba was 987,740 (long) tons; in 1917 the production was 3,023,720 tons; also that Japan is developing cane sugar production in Formosa, erecting a factory involving one million sterling in Manchuria, and proposing to erect another factory in Korea.—(Feb. 20.)

LEGAL INTELLIGENCE.

Contracts with Enemy Subjects.—In the House of Lords on January 25, four important decisions were given in appeals arising out of contracts between British and enemy subjects.

The *Rio Tinto Co., Ltd.*, an English company mining in Spain, had prior to August 4, 1914, contracted separately with the firms of: *Eitel Bieber* (Hamburg), the *Dynamit A.-G.* (Hamburg), the *Vereinigte Koenigs und Laurahuette A.-G. für Bergbau und Huettenbetrieb* (Berlin), for the supply in the aggregate of several million tons of sulphide copper ore. In the first case, the Metall-Gesellschaft of Frankfort, in its capacity as agent for the English company, had entered into the forward contracts for the sale of ore in Germany and elsewhere. Mr. Justice Sankey had made an order dissolving the agreement, and the Court of Appeal had affirmed his decision. The German company now appealed to the House of Lords to decide that the contracts had not been abrogated and avoided but merely suspended during the period of the war.

In moving that the appeal be dismissed with costs, Lord Dunedin (on the Woolsack) said that the continuance of contractual relations between British subjects and alien enemies afforded opportunities for the conveyance of information which might influence the conduct of the war, or might tend to increase the resources of the enemy, who could denude himself of present stocks in view of their certain replenishment after the war, and curtail the stocks of British subjects on account of future liability to deliver. The other Lords concurred, and the appeal was dismissed with costs. The two other appeals were treated similarly.

In the fourth case, *Hugh Stevenson and Son, Ltd.* v. *The A.-G. für Cartonnagen-Industrie*, the British firm appealed against a majority decision of the Court of Appeal which had decided that by reason of the dissolution of partnership between the parties owing to the war, the respondents were entitled to the same share of the profits, accrued before and during the war, as on an ordinary dissolution. The Lord Chancellor said that it was not the law of this country that the property of enemy subjects was confiscated, and that after the restoration of peace they were entitled to their property with any fruits which it might have borne in the meantime. In the present case the English partner had continued the business during the war, using the machinery in which the German partner had a part interest, and the latter would be entitled to some allowance in respect of that interest. The other Lords concurring, the appeal was dismissed with costs.

Acetone Distillation Plant. *Blair, Campbell and McLean* v. *The Synthetic Products Co., Ltd.*

The hearing of this case (this J., 1918, 38 R) was continued on February 11, 13, 14, 15, before Mr. Justice Salter in the King's Bench Division. In giving evidence for the defendants, Mr. J. R. Wincop, secretary of the defendant company, stated that the selling price of acetone to the Government was £120 per ton, and that the average price realised for butyl alcohol from January 1 to March 14, 1916, was £132 per ton. By their contract they were to supply the Government with acetone at cash prices based upon the figure at which they purchased potatoes. One half of the difference between the market quotation and the cost of production was reckoned as the profit for the company. Between January and March, 1916, they made five sales of acetone at an average price of £170 per ton. To get 744·3 lb. of acetone, 39 tons 5 cwt. of potatoes would be required. Mr. A. Powell, K.C., counsel for the plaintiffs, here pointed out that with this yield it would be necessary to use 826 tons of potatoes to make the 7 tons of acetone per week which the defendants wanted to make their process a paying one. Mr. E. Robinson, chemist, gave evidence to the effect that the still could not deal with the guaranteed amount of mash; it never produced anything like pure acetone when he was in charge.

Mr. J. W. Hinchley expressed the opinion that with a continuous still it was impossible to obtain acetone up to the Government specification, because the distillate was contaminated by volatile constituents which could not be effectively eliminated in such a plant. In a discontinuous still, the gases evolved would be allowed to escape into the atmosphere and the other volatile products would be retained in the first runnings. In a pot-still it would be possible to produce acetone up to the Government specification in one distillation. In cross-examination witness said that it would be foolish commercially to use a discontinuous still when dealing with 50,000 gals. of mash per day; any firm which tried to get pure acetone in one distillation from the still supplied would be ruined; the effective way would be to carry out two distillations.

Mr. A. R. Ling also gave evidence, expressing the opinion that it would be impossible to produce acetone up to Government standard from crude potato mash in one distillation.

Mr. T. Kane, manager of defendants' factory at King's Lynn, said that a weekly yield at $3\frac{1}{2}$ tons of acetone and $5\frac{1}{4}$ tons of butyl alcohol would, after paying 10 per cent. for royalties, give a return of £1003 per week.

Mr. Powell, having pointed out that according to the reports of Dr. Hose, $647\frac{1}{2}$ tons of potatoes were required to make $3\frac{1}{2}$ tons of acetone, his Lordship observed that the figures appeared to show that, on the prices mentioned in the counter-claim, there was a loss of about £1000 a week. Mr. Powell agreed, but said that the defendants asserted they required only 500 tons of potatoes to produce 7 tons of acetone and 14 tons of butyl alcohol, but the figures proved that it took $647\frac{1}{2}$ tons to yield half these amounts. His reply to defendants' claim that if they produced 7 tons of acetone weekly they would make a profit of £761, was that they could not obtain this amount with a wash containing only 0·4 per cent. of acetone.

Mr. J. C. Lawrence, re-called for the plaintiffs, said that had he known that a wash of 0·4 per cent. of acetone was to be used he would have designed an entirely different still. The still supplied would do its work with a 0·8 per cent. wash if the fermentation was perfect. He could not say if it would furnish pure acetone in one distillation as that would depend upon the impurities present.

This concluded the evidence.

Arbitration: Construction of Agreement. *The Anglo-Continental Chemical Co., Ltd.* v. *The Saccharin Corporation Ltd.*

In the King's Bench Division on January 31, Mr. Justice Sankey heard a special case stated by the arbitrator in a reference between the two parties.

The Anglo-Continental Chemical Co. asked for a declaration that it was entitled to certain profits upon saccharin sold in the United Kingdom by the Saccharin Corporation, and also for an order to examine its books.

Mr. Hogg, for the Company, said the Saccharin Corporation owned certain patents which protected the production of saccharin in this country, the validity of which was attacked by the company, and litigation ensued. In 1901 an agreement was made by which defendants bought his clients off by granting them a portion of their profits. In 1909 the agreement was modified, whereby his clients were entitled to 5/24ths of the profits of the Saccharin Corporation on the sale of saccharin in the U.K., and it was upon the construction of this latter agreement that the dispute arose. They were further entitled to send their accountant to examine the books, and to have all reasonable information supplied them. In 1913 and 1914 his clients got nothing, on the grounds that there were no profits. When they sent to examine the accounts they were told that there were certain agreements with Continental firms under which payments were made to these firms which prevented the realisation of any profits. His clients wanted to find out how these agreements arose, and desired to see them, but were told no information could be given. Hence they went to arbitration. It then appeared that there was an agreement made in 1911 under which the Corporation had entered into working arrangements with certain Continental manufacturers who intended to compete in the English market as soon as the patent ran out in 1912. To prevent this, the Corporation made an agreement with the Company under which the Corporation was to have the monopoly of supply in the United Kingdom, but was to pay three-fourths of any profits made to this syndicate of Continental manufacturers after debiting certain sums they had to pay to other people, whom they had bought off from competition, and interest on £30,000 capital. The Saccharin Corporation now claimed that it was entitled to debit this three-fourths profit against the Anglo-Continental Company, in which case the remaining one-fourth was insufficient to pay certain preferential claims to debenture

holders and others, so that there was nothing for plaintiffs. A remarkable point in the agreement with the Continental manufacturers was that the Corporation had the right to receive all the saccharin it required from the syndicate for export at 25% less than the lowest export price, and the Corporation was to keep the whole profit resulting from such business. Most of the syndicate manufacturers were German, and when war broke out they became alien enemies. A new agreement was then made between defendants and one Swiss and two French firms, under which 55 per cent. of the profits went to the Corporation, and 40 per cent. to the Swiss and French firms.

Plaintiffs asked his Lordship to decide (1) whether they were to have the information they desired; (2) if the Corporation had the right to make the syndicate agreement and the war agreement with Continental manufacturers without the plaintiffs consent. The plaintiffs said the defendants were not entitled to debit against the payments they made to the Continental manufacturers in arriving at their profits, but that they ought first to give them their proportion of the profits made on sales in this country, and then divide the remainder of the profits between the syndicate.

The arbitrator expressed the opinion that the subsequent agreements with the syndicate of Continental manufacturers was essential to the Corporation, if it was to continue to retain its business, but in taking this view counsel submitted that he was wrong in that the agreement with the syndicate dealt with business outside the United Kingdom in which the Corporation had an interest, and on which they could make a profit.

Mr. Maugham, for the Corporation contended that the real question was one as to the mode of calculating the net profit in relation to sales in this country. When the parties entered into this agreement the Company was aware of the exact position in which the Corporation stood, and that it was only making saccharin in sufficient quantities in this country to satisfy the requirements of the patents held by it. Having regard to the fact that the patents were nearly run out, the Company knew that it was absolutely necessary for the Corporation to come to some arrangement with the Continental firms comprising the syndicate. There was no objection to the accounts being seen, and the matter resolved itself into a question of the method in which the net profit was to be computed.

The further hearing was adjourned.

GOVERNMENT ORDERS AND NOTICES.

TAR OILS CONTROL ORDER, 1918.

(Abstract.)

(1) The Ministry of Munitions takes possession as from February 1, of all tar oils in the United Kingdom. (2) All transactions therein must be licensed except (3) (A) for quantities below 5 galls. or (B) in the fulfilment of existing contracts for the purchase or sale of tar oil for benzol washing or the manufacture of septic drugs, lamp or vegetable black, or fuel, the amount not exceeding one month's average, calculated from the preceding three months. (4) Prices must not exceed those in schedule attached unless authorised by licence, or contracted prior to July 13, 1917. (5) Not more than 5 galls. may be used per month without licence. (6) Details of output, stocks, purchases, sales, etc., must be furnished to Controller of Explosives Supply, Storey's Gate, Westminster, S.W.1. as required. (7) All persons hitherto required to furnish returns must continue to do so. (8) Tar oil means light oil, sharp oil, creosote oil, green oil, and anthracene oil, and any other oil produced from or containing an admixture of oil produced from the distillation of gas coal tar, coke oven tar, oil gas tar, producer gas tar, water gas tar, and Mond gas tar, or any of them with the exception of crude benzol, crude naphtha, crude solvent naphtha, solvent naphtha, heavy naphtha, crude carbolic acid, light oil containing recoverable amounts of benzol and toluol, and oils produced from the said tars or any of them containing more than 50 per cent. of pyridine or any other tar bases. (9) The previous Order, dated October 23, 1917, is cancelled, but has effect up to February 1. (10) Applications for licences must be made to Controller, Mineral Oil Production Department, Ministry of Munitions, 8, Northumberland Avenue, London, W.C.2.

The schedule of maximum prices should be consulted in the original. Briefly it is as follows: (1) Oils for benzol washing. (A) Creosote of sp. gr. not less than 1·020 with crystallising point below 45° F. is 103s. per ton. (B, Green oil, sp. gr. not less than 1·05, 98s. per ton. (2) Oil for fuel purposes 41s. 6d. to 90s. 6d., according to quality, *i.e.*, percentage of pitch. The method for estimating pitch is described. An additional charge of 5s. per ton for fuel oil may be made to cover the cost of retreating, etc. A commission not exceeding 2½ per cent. above these prices may be charged by brokers, dealers and merchants. Conditions as to analyses, carriage, tankage, and barrelage are also given. [For full text, see *Bd of Trade J.*, Feb. 7, 1918.]

COPPER SULPHATE ORDER, 1918.

The Minister of Munitions has issued an Order (February 15) fixing maximum prices for copper sulphate of not less than 98 per cent. purity in the United Kingdom. Holders of stocks, manufacturers, etc., are to make returns as and when required; and applications in reference to the Order are to be addressed to the Director of Acid Supplies, Ministry of Munitions, Department of Explosives Supply, Storey's Gate, Westminster, S.W.1., and marked "Copper Sulphate." The following are the prices per ton in the case of sales for delivery free on rail, cart, barge, or ship at makers' works or nearest siding, railway station or available wharf (first schedule): For delivery January—February, 1918, £48; March—April, £50; May—August inclusive, £52.

In the case of sales for delivery ex vendor's store or shop or ex warehouse, railway goods yard or public wharf, the prices specified in the second schedule are to apply:—

Quantity incl. in sale.	Date for delivery.		
	Jan.-Feb.	Mar.-Apr	May-Aug. inclusive.
2 cwts. and over	54s.	55s.	56s. per cwt
56 lb. and over, but under 2 cwt.	56s.	57s.	58s. ,,
28 lb. ,, ,, 56 lb.	58s.	59s.	69s. ,,
8 lb. ,, ,, 28 ,,	6½d.	7d.	7d. per lb.
4 lb. ,, ,, 8 ,,	7d.	7½d.	8d. ,,
1 lb. ,, ,, 4 ,,	8d.	8½d.	9d. ,,

[The full text of the Order is given in the *London Gazette*, February 15.]

MAXIMUM PRICES OF IRON AND STEEL.

The Ministry of Munitions has issued notices (February 1 and 15) fixing maximum prices for bar iron, steel, etc., with reference to the General Permit of November 1, 1916.

HIGH-SPEED TOOL STEEL.

Prices and extras fixed by the General Permit of November 1, 1916, as subsequently modified, are again modified. (February 15.)

VERONAL.

By a recent Order-in-Council, diethyl barbituric acid and other derivatives of barbituric acid, are now included in Part I. of the Schedule of Poisons in the Pharmacy Act, 1868, as amended by the Poisons and Pharmacy Act, 1918.

OTHER ORDERS.

Gas (Use in Motor Vehicles) Local Prohibition Order, 1918 (dated February 9).

Motor Spirit and Lamp Oil (Maximum Retail Prices) Order, 1918 (dated February 6).

The Cattle Feeding Stuffs (Maximum Prices) Order, 1918.

THE ROSIN CONTROL ORDER, 1918.

The Minister of Munitions orders (Jan. 31) that holders, etc., of rosin or rosin oil shall furnish returns to the Controller, if they have had, since January 1, 1917, in their possession or under their control an amount of rosin exceeding three ordinary American barrels, or one cask of French Spanish, or Portuguese rosin, or an amount of rosin oil exceeding 7 cwt. net weight.

All dealings in rosin and rosin oil are now controlled, and licences are required for quantities exceeding an aggregate of three ordinary American barrels or one cask of French, Spanish or Portuguese in the case of rosin, or 7 cwt. net weight in the case of rosin oil during any one calendar month or for the sale or delivery of such maximum quantity or any such purchase. Applications for licences should be addressed to: The Controller, Non-Ferrous Materials Supply, M.S.-L., Ministry of Munitions, 8, Northumberland Avenue, London, W.C.2.

[For full text see *Bd. of Trade J.*, Feb. 7.]

POTASH FERTILISERS.

The Controller of Potash Production has given notice (Feb. 8) that until May 31, 1918, potassium compounds may be purchased (irrespective of the Order of Oct. 17, 1917), provided that they are used wholly by the purchaser for direct and immediate application as a fertiliser to the flax crop in Ireland and to no other crop, and provided that they are purchased from or through an agent prescribed for that purpose by the Department of Agriculture and Technical Instruction for Ireland. Quantities purchased must not exceed an aggregate of three tons during any one calendar month, and are to be used wholly by the purchaser for direct and immediate application to the ground as a fertiliser.

A similar Notice is given relating to Blast-furnace Dust containing more than 13 per cent. of K_2O. [The Notices are given in full in the *Bd. of Trade J.*, Feb. 14.]

Natural Indigo.—Persons owning stocks of natural indigo in the United Kingdom or knowing of consignments afloat to the United Kingdom, are requested to forward to the Secretary, War Trade Department, 4, Central Buildings, London, S.W.1, not later than February 23, the particulars of such stocks or consignments, in envelopes plainly marked in the top left corner " Indigo Return."

The particulars required are :—Address of store or name of vessel, quantity in lb., description.

REPORT.

Annual Report of the Government Chemist for the year ended March 31, 1917. [Cd. 8905. 3d.]

Over a quarter of a million samples were examined during the year showing that the war demands on the department are still growing. The newer war work includes numerous questions submitted by the War Trade Department, the Foreign Office, the Treasury Solicitor and the Admiralty Marshal relating to contraband trading with the enemy and thus brings to the knowledge of these departments the present-day importance of chemistry in the national interests.

During the year, there was a slight recrudescence of the arsenic in beer trouble of a few years ago, six samples of beer and brewing materials being found to contain arsenic in excess of the one-hundredth of a grain of As_2O_3 per lb. or gallon. Cider in certain cases was found to be factitious, that is to say, did not consist solely of fermented apple juice, and the table-water duty has thrown fresh duties on the department.

The sugar excise gives a considerable revenue and at the same time imposes a large amount of routine departmental work. The amount of sugar liable to tax, in imported egg yolk, gelatine, glue, honey, manna, meat extracts, parchment paper, printers' roller composition, and tanning extracts has been determined in many cases, and made to contribute to the revenue of the country, whilst on export the fixed rates of drawback have been revised by the analysis of fresh samples representative of the goods exported. Eight samples of molasses from the British beetroot sugar factory at Cantley were examined, and also several molasses solutions used in the new yeast-making industry. Saccharin does not escape a careful search as the inducement to smuggle this article into the country is now very great. It is used in condiments, dentifrices and medicinal preparations, and in glycerine substitutes.

The Admiralty has submitted under its contracts food substances and other contract stores. Many of the tender samples of butter for naval hospitals contained boron preservative contrary to the specification, but most of the samples from canteens were of satisfactory character.

No fresh milk was imported into the country during the year and only one consignment of sterilised milk was sampled. Samples of condensed milk from America with low fat content, and many consignments of much lower strength than usually prepared for this country were received.

Imported butter came from places so far remote as India and Iceland, the latter being free from preservative and colouring matter in all cases, and only containing 8·9 per cent. of water out of an average of 15 samples. Imported margarine in 3 cases exceeded the limit of 16 per cent. of water.

The War Department submitted 22,372 cases of food supply, representative of a very large quantity of goods, but no return is given as to the results of these examinations. Even in war time, gold lace figures amongst the miscellaneous samples required by the War Office to be examined by this department.

S. R.

Prohibited Exports.—An Order of Council, dated February 8, further amends the list of goods and materials which may not be exported from the United Kingdom.

TRADE NOTES.

BRITISH.

Conditions of Work in the Chemical Trades.

The following are the terms of the agreement recently arrived at between the Chemical Employers' Federation and twenty of the Unions representing Process and Unskilled Workers employed in the Chemical Trade, as the result of three Joint Conferences :—

(1) The members of the Chemical Employers' Federation pledge themselves to abolish the seven 12-hour shift system after the war, or earlier where possible. The Unions accept this pledge but do not withdraw their claim for an 8-hour day, intending to raise the claim again when occasion is opportune.

(2) In the cases where the seven 12-hour shift system is converted into the 8-hour system, the following shall be the basis upon which the 8-hour shift rate shall be fixed :—

> In those districts in which 8-hour shifts are generally worked the rate paid per shift shall be the current standard rate being paid in that district for an 8-hour shift.
>
> In those districts where 8-hour shifts are not in general operation, the rate per shift shall not be less than that paid in the majority of districts in which 8-hour shifts generally obtain.
>
> Any dispute arising shall be referred to the National Industrial Council for settlement.

(3) The members of the Chemical Employers' Federation agree to pay process workers on shift work time and a half between the hours of 10 p.m. Saturday and 6 a.m. Monday in each week.

(4) The members of the Chemical Employers' Federation agree that the rate of overtime payable to semi-skilled and unskilled workers shall be time and a quarter for the first two hours, and time and a half thereafter until the next starting time.

(5) The members of the Chemical Employers' Federation agree to give a week's holiday annually with full pay to all members of the signatory Unions, conditional upon such qualifications as to conduct and time-keeping as may be determined by the National Industrial Council.

The employers agree that any firm having an equally or more generous scheme in force shall leave such scheme unchanged except by mutual agreement with the Unions.

The Unions agree that any firm whose qualifying conditions for holidays under an existing scheme are more rigid than those determined by the National Industrial Council, shall not be required to relax such conditions.

The representatives of the Federation and of the Unions were heard by the Committee on Production on February 8, 1918, which has recorded the foregoing agreement as its finding :—As agreed between the parties, the arrangements referred to in paragraphs (3) and (4) in the Agreement are to be put into operation as from the commencement of the first full pay after January 8, 1918.

* * * *

Trade Marks.—The Trade Marks Committee of the Federation of British Industries has decided to oppose Part 2 of the proposed new Government Bill "To Amend the Trades Marks Act, 1905," on the ground that it will inflict serious injury on the owners of perfectly legitimate Trade Marks. Part 2 deals with "Provisions for the Prevention of Abuses of Trade Marks." It has also been decided by the same Committee that the proposed British Empire Trade Mark should be opposed.

Fats in the Cotton Trade.—At a meeting of the North of England Tallow Refiners' Association, held in Manchester on January 22, the following resolution was passed :—"That the Manchester Chamber of Commerce be approached by the Secretary of this Association with a view to obtaining returns from the users of tallow as to the amount they require in their respective industries, and that the Chamber of Commerce be further requested to aid the Association in its endeavour to secure the release of raw materials for use from the Ministry of Food."

British Industries Fair (Glasgow), 1918.—Owing to an accident to the roof of the building in which this Fair was to have been held, the opening has been postponed until May. Chemical products are to be exhibited.—(This J., 1918, 19 R.)

Canadian Linseed Oil for Australia.—The Medicine Hat, Alberta, linseed oil mills have shipped several carloads of linseed oil to Australia, which is the first oil ever shipped from Canada to that country. This is the beginning of what may become a very important development. Formerly the oil used in Australia was obtained from England.

Adulteration of Indian Produce.—A circular letter has been addressed by the Government of India to Indian Chambers of Commerce on the prevalence of the practice of adulterating Indian produce before export. In respect of some products improvement has in the past few years been effected, but on the whole the Government of India is of opinion that the reverse is the case. Cotton is still watered, jute is still watered, groundnuts, hides, indigo, and oils are freely adulterated. It is unnecessary, the circular states, to dilate on the loss to Indian trade which this practice of adulteration must involve, but it appears to be specially important at the present time to endeavour to focus attention on the matter. The preventive measures already adopted relate to wheat, cotton, jute, hemp and leather. In 1915, the Imperial Institute drew attention to the adulteration of Indian beeswax, pointing out that if a continuous supply of pure wax could be obtained it was probable that the greater part of the Russian beeswax trade, which was formerly in the hands of Germans, would remain permanently in British hands, and a steadily increasing industry for India would result. The Government of India still inclines to the opinion that the evil is not one which should be met by legislation, and that the remedy lies in the hands of the merchants.—(*Ch. of Comm. J., Jan.*, 1918.)

FOREIGN.

Norwegian Superphosphate Industry.—The New Superphosphate Company at Knarvik, which commenced operations last summer, has already found it necessary to increase the capital from 3,000,000 kr. to 5,800,000 kr. Some 8000 tons of superphosphate have already been produced; the working of the apatite deposits is about to be undertaken, and a copper extraction factory is in course of construction.—(*Engineering, Jan.* 25, 1918.)

Sale of Pacific Phosphate Islands.—The United States Consul-General at Auckland, New Zealand, states that, according to published reports, the phosphate deposits in the Pacific, owned by German interests, have been taken over by British interests, including the deposits on Ocean and Ngaru Islands, which are considered among the finest phosphate deposits in that part of the world. In the past the companies operating them have paid dividends of 25·75 per cent. The question of the New Zealand Government securing some of these deposits in order to make sure of a

sufficient supply of phosphates for the Dominion has been taken up in Parliament.—(*Ch. of Comm. J., Jan.*, 1918.)

* * *

Cottonseed Oil Trade in the U.S.A.—At the present time fully 50 per cent. of the sales of refined cottonseed oil are made upon the pound basis; the crude oil on the other hand is sold on the gallon basis. Every refiner of cotton oil in the U.S. has now signed an agreement to purchase and sell refined oil on the pound basis as from Jan. 1, 1918.

American Company News.—Graphite is to be mined in Alabama by the Talladega Pardale Graphite Co., which has been incorporated with a capital of $100,000.

The United States Potash Products Co. has been formed with a capital of $5.500,000 to produce and market potash and alum.

The United States Industrial Alcohol Co. has made remarkable strides in its financial position and earning power during 1917. The estimated earnings for that year are $10,000,000, after allowing for taxation and depreciation, which is sufficient to pay $78 per share on the common stock. The dividends paid on the latter in 1917 amounted to 32 per cent., 16 per cent. being for the year 1916.—(*Oil, Paint and Drug Rep., Dec.* 24 *and* 31, 1918.)

* * *

Foreign Companies, etc.—Java.—The Quinine Works in Bandong is carrying out large extensions in order to increase the daily output of quinine to 2000 kilo. The necessary machinery is on the spot.—(*Dec.* 4.)

Denmark.—The Danish Stahlwarenfabrik in Lyngby, and the A.-G. Electro-Stahl of Buddinge, have been taken over by a new company called the "Dänische Stahlindustrie," with a capital of 3,500,000 kr.—(*Nov.* 16.)

Sweden.—The A.-G. Kemisk Industrie has been formed chiefly for the purpose of manufacturing aniline dyes formerly imported from Germany. At present the factory is being extended so as to produce the necessary raw materials for dye manufacture as well as for munitions and medicinal purposes. It is hoped to begin operations next autumn with the manufacture of about 100 dyes, and all the medicinal chemicals needed for home consumption. There will be a staff of 25—30 chemists. The capital of the company amounts to 5.000,000 kr. It is stated that the Stockholms SuperfosfatFabriks A/B., one of the principal firms in the Swedish chemical industry, is interested in the enterprise.—(*Nov.* 23.)

Japan.—The monthly production of calcium acetate (80%) is said to be 228,908 kilo., which represents about 36 per cent. of the total consumption, the rest being imported. There is a big demand for crude methyl alcohol, from which 99 per cent. pure alcohol, 95 per cent. and 90 per cent. wood spirit are prepared. The pure product is mostly used for the production of formalin, the annual demand for which amounts to 1,500,000 pounds (= 260,000 pounds crude wood spirit monthly). The following firms are at present manufacturing crude wood spirit:—Nippon Acetic Acid Co., Shiwobara Works, Kabafuto Government Works, Tottori-ken, Kondo Works, Chichibu Works. These factories produce only about 14·5 per cent. of the total requirements.—(*Nov.* 27.)

Germany.—The Ostelbischen Spritwerke and the Breslauer Spritfabrik, having common interests, have obtained authority to double their capital. The former company will now have a capital of 9.000,000 mk. and the latter 8,500,000 mk. —(*Nov.* 2.)

The Deutsche Mineralöl-Industrie A.-G. of Wietze, the greater portion of whose shares are owned by the Deutsche Erdöl A.-G., and the Deutsche Petroleum-Industrie-A.-G., show a gross profit of 7,045,925 mk. for 1916—17 (4,371,489, 1915—16), and propose a dividend of 25 per cent. (6 per cent. 1915—16.)—(*Nov.* 2.)

The Bayerische Stickstoffwerke A.-G. (Bavarian Nitrogen Works) manufacturing calcium nitrate by the Caro process report a reduction in their gross profit, from 2,749,128 to 2,326,873 mk. carrying forward 122,303 mk. (1915—1916: 66,154 mk.). Dividends, 14 per cent. The company has extended its scope by interesting itself in foreign undertakings, and took part in the formation of the Tetralin G.m.b.H. and the Ungarische Erdgas Gesellschaft. A number of factories for the manufacture of carbide and calcium nitrate by the company's process and under its direction have been erected for a foreign account. —(*Nov.* 16.)

The partners of the Mineralölwerke F. Saigge and Co. G.m.b.H. of Peine, the Rheinisch-Hannoversche Erdölwerke G.m.b.H. of Peine, and the Erdölbohrgesellschaft Wietze G.m.b.H. (in liquidation) of Peine, have assigned the whole of their shares to the Oelwerke Julius Schindler, Hamburg. The three former companies are at present combined with the Oelwerke Julius Schindler, but are carrying on as before under the name of the Mineralölwerke Peine. The headquarters will remain at Peine. (*Nov.* 2.)

The Chemische Fabriken Harburg-Stassfurt, vorm. Thörl und Heidtmann A.-G. of Harburg made a net profit of 137,942 mk. (153,574 mk. 1915-16), paid a dividend of 9 per cent (10 per cent.) and carried forward 51,994 mk. (53,349 mk. 1915-16). For some time past this company has been working a new process for the recovery of oil, and it intends to continue this branch of the business after the war.—(*Nov.* 2.)

The Wülfing, Dahl A.-G., in Barmen, owned by Farbenfabriken vorm. F. Bayer and Co., had a balance of 1·5 million mk. on a capital of 1 million mk. for the last financial year. The net profit was 865,993 mk., of which only 150,000 mk. was distributed in dividends (15 per cent.), 375,000 mk. was placed to reserve and 319,993 mk. carried forward. The small dividends are due to lack of liquid resources. The reserve fund now amounts to 1·5 million mk.—(*Nov.* 30.)

New Company.—Deutsche Ox-hydric-A.-G., Charlottenburg, 3,350,000 mk.

Increased Capitals.—Dortmunder Eiswerke G.m.b.H. from 20,000 to 40,000 mk. Dortmunder Ritterbrauerei, A.-G., to 1,500,000 mk. Eintracht Braunkohlen u. Brikett Werke, Neuwelzow, to 4,000,000 mk. Freia Braunkohlenwerke A.-G., Berlin, to 5,000,000 mk. Mannesmannröhren-Lager G.m.b.H., Leipzig, to 900,000 mk. Norddeutscher Cement Verband G.m.b.H. Oppeln, to 600,200 mk. Rheinisch-Westfälisches Kohlen-Syndikat, Essen, by 5,100,000 mk. A.-G. Wickingsche Portland Cement und Wasserwerke, Recklinghausen, by 500,000 mk.—(*Nov.* 16.)

Chemische Fabrik von Heyden A.-G., Radebeul. The directors propose increasing the share capital by 3.000,000 mk. The last increase was made by this company in 1912, when the capital was raised from 6,000,000 to 7,000,000 mk.—(*Nov.* 2.) [*Z. angew. Chem.*, 1917.]

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, Feb. 7 and 14, 1918.)

OPENINGS FOR BRITISH TRADE.

Applications have been received for names of suppliers of perfumery, levigated iron, and plant for the production of caustic soda by electrolytic process.

TARIFF CUSTOMS AND EXCISE.

Bermuda. The revised import tariff list, operating from January 1, 1918, includes the following articles with rate of Import Duty:—Kerosene oil, per gall., ¾d.; patent or proprietary medicines, claiming curative or remedial properties, and not included in the pharmacopœias of Great Britain or the United States, toilet creams and face powders and lotions, 20 per cent. *ad val.*; wood alcohol, wood naphtha, methyl alcohol and methylated alcohol, per gall., 3d.; on all other goods, except such as are mentioned in the Table of Exemptions, and such other goods (if any) as are exempt from import duty under any other Act, 10 per cent. *ad val.*

A list of exemptions includes goods imported "on public account," fertilisers, and vessels in which carbon dioxide and other gas is imported.

Brazil. Material imported for meat freezing is duty free.

Canada. Margarine is now being exported from the U.S.A. to Canada. Licenses to import or to manufacture became operative on December 10, 1917. Regulations regarding the manufacture and importation are exceedingly strict, *e.g.*, no oleo-margarine may be imported unless made under the Government inspection in the land of origin. No substitute for oleo-margarine may be imported or made in Canada.

France. Exportation of hyposulphite of soda is absolutely prohibited.

Portugal (*Mozambique*). By an Order dated January 14, 1918, the exportation of oleaginous seeds and products of such seeds to all foreign countries has been prohibited.

Norway. The exportation of the following materials has been prohibited:—Acorns, salts of chromium, chrome alum, iron and steel, all goods and industrial products containing a material proportion of iron and steel excluding ferro-silicon. The exportation of bismuth and its compounds is now also prohibited.

Sierra Leone. The following new export duties are levied as from January 1, 1918:—Palm kernels, per ton, 10s.; palm oil, per ton, 10s. 5d.; kola nuts, per cwt., 1s. 8d.

Straits Settlements. A Bill has been drawn up to amend the Sale of Food and Drugs Ordinance, 1914. The ingredients of patent medicines will have to be disclosed.

Sudan. Ground nuts may no longer be exported except under licence.

Tongan Islands.—Amended duties are in force for benzene, dynamite, kerosene, methylated spirits, coal and coke. The export duty on copra is now 15s. per ton.

United States. Certain new regulations have been received by the Board of Trade governing the importation of tanning materials, hides and skins and finished leathers into the U.S.A.

Uruguay. An export duty of 4 per cent. is now payable on cattle hides, sheepskins and tallow on the following valuations fixed for the fiscal year 1917—18:—Cattle hides, dry, 80 pesos per 100 kilo., salted, 45 pesos; sheepskins, 75 pesos; and tallow, 25 pesos per 100 kilo.

"German" East Africa. This country is now open to trade. Applications for traders' licences should be addressed to the Senior Political Officer, Dar-es-Salaam.

COMPANY NEWS.

THE GAS LIGHT AND COKE COMPANY.

The ordinary general meeting was held on February 8, the Governor, Mr. J. Miles, presiding. The income during the past year amounted to over £7,000,000, raw materials cost £3,287,000, the quantity of coal consumed was over 2,000,000 tons and the gas manufactured exceeded 31,000,000,000 cub. ft. The sales of gas increased by 6 per cent. over those in 1916, and there was an increase of 3869 in the number of consumers. Working expenses were nearly £1,000,000 higher, of which increased wages accounted for £264,000. The prices fixed for sulphate of ammonia are considered to be much too low in view of the increased prices of raw materials. A dividend was recommended at the rate of £3 14s. 8d. per cent. per annum on the ordinary stock for the half-year ending December 31 last, leaving £251,044 to be carried forward to the credit of the current year. Considerable difficulty has been experienced with the quality of the coal, which in some cases contained 30 per cent. of ash. A new research laboratory has been installed and new products are being manufactured. The plant erected for the production of nitric acid from ammonia was the first of its kind in the country. A Bill has been deposited in Parliament with the object of amending the statutory provisions governing the sliding scale of dividends.

SOUTH METROPOLITAN GAS COMPANY.

Speaking at the half-yearly meeting on February 13, the Chairman, Dr. Chas. Carpenter, referred to the hardships suffered by the shareholders, the profits being only sufficient to pay £2 7s. per cent. on the ordinary stock, and the Reserve Fund having to be drawn upon in order to pay the sliding scale dividend of £4 per cent. The amount paid in wages for the half-year was £502,626 compared with £299,000 expended over a similar period in 1914. There was an increase of 7·35 per cent. in the sales of gas. Despite the fact that the cost of coal during the period had risen by over £200,000, the fixing of the prices of by-products had prevented the company recouping itself for this increased outlay—in fact, receipts for ammonia had been less owing to the restrictions on the export of sulphate of ammonia. An extraordinary general meeting was held subsequently to consider the terms of a Bill to raise further capital, and to fix the standard price of gas at 3s. 7d. per 1000 cub. ft., instead of 3s. 1d.

HOLZAPFELS, LTD.

The tenth ordinary general meeting was held at Newcastle-on-Tyne, on January 13, Col. Sir H. Jekyll, the Chairman, presiding. The gross profits during the past year were £88,281, a record for the company, and the profit available for distribution was £78,332. £15,000 was to be applied to writing down the item of goodwill, which would thereby be reduced to £30,000; dividends at the rate of 6 per cent. on the preference shares and 10 per cent. on the ordinary shares were passed, and £26,332 was left to be carried forward.

BOOK REVIEW.

Chemistry in the Service of Man. *By Alexander Findlay. 2nd Edition. Pp. xv.+272. (London: Longmans, Green & Co., 1917.) Price: 10s. 6d. net.*

The material services rendered by science during this great international crisis have led to a recognition of its powers and achievements which has long been overdue. This outcome of one of the many lessons of the war augurs hopefully for a fuller appreciation of the services of scientific study and research towards the advancement of knowledge and the benefit of mankind. But for this appreciation to be maintained and to be extended beyond immediate economic utility it is essential that the facts, methods, and principles of science should become known and trusted. The teaching of the methods of science forms the surest basis for the recognition of its value, both as a subject of study and as a concomitant of industry, and such teaching is especially of service in bringing home the place and importance of research to those whose training and vocation have been in other fields of work. The defects that are responsible for the mental outlook upon science in the past are far too widespread and deep-seated to be attributable to any one cause; but the scientist himself must accept his share of the aggregate blame. Despite many efforts at reform, the teaching of the past has been too closely associated with the science of the laboratory, rather than with the far bigger science concerned with the phenomena of Nature and the progress of industry. The former leads to dull and stereotyped pedagogy: the latter to a real and living interest. The teaching and writing of chemistry have suffered perhaps more than those of other sciences in this respect, a fact due in part to the technical details of language and of method associated with chemical science which makes it difficult to render it "understanded of the people," and partly to the position of "splendid isolation" which the chemist, in common with many other scientists, has been apt to maintain and which is so hopeless as a means of securing the sympathetic appreciation of those who stand and wait outside the charmed circle of his knowledge.

That the scientist has begun to recognise that it is high time for him to step down from this pedestal, is evidenced by several works which have been recently published with the object of bringing home the fundamental importance of science and research in national life and progress. Prof. Findlay's "Chemistry in the Service of Man" was one of the first of these, and the fact that a second edition has already been called for, is a welcome sign of awakened interest in the study of science and its industrial applications. The book is based on a series of lectures delivered in Aberdeen in 1915. The lectures were given to an audience having no claims to a knowledge of chemistry, and the book is similarly designed for the general reader, although many a student and worker in chemistry will find much of the contents helpfully complementary to his more usual literature.

With the whole range of chemical science and its industrial applications as the field from which to tell something of the story of chemistry and its achievements, it is no easy matter to select the most suitable material, nor are any two authors likely to choose the same problems to illustrate their story. Prof. Findlay has certainly made a representative and judicious selection. The choice, however, is of secondary importance, provided the story is well told, for there is but one chemistry, and the service of the science and the results of research can be equally well illustrated from almost every department of inorganic, organic, and physical chemistry. An introductory chapter deals with the constitution of matter from the atomic standpoint, elements and compounds, and the atomic hypothesis in a sufficiently explanatory manner for the understanding of the technical details of the sequel. This is followed by chapters on Combustion, the Chemistry of Illuminants, Energy, Fuel and Explosives, and Cellulose and Cellulose products in which the petroleum and coal gas industries, the manufacture of matches, fuel economy and the manufacture of explosives and of paper and artificial silk are described. The velocity of reactions and catalysis are then dealt with as a preliminary to descriptions of the fixation of atmospheric nitrogen, the alkali industry, and the manufacture of glass and soap. Succeeding chapters deal with the services of Electricity to Chemistry, the Colloidal State, Molecular Structure, Synthetic Organic Chemistry, and Fermentation and Enzyme action.

In each section a simple and suitable account is given of the chemical principles involved in the preparation of the products described and of the service of researches in pure science on the development of industrial processes. The important bearing of reaction velocity, the reversibility of reactions and catalysis on the manufacture of sulphuric acid, nitric acid and ammonia, are particularly well brought out, and the outline of the technical processes described is very happily augmented in many cases by an account of their historical development. In some few instances, especially those concerned with organic chemistry, the subject matter concerned is too restricted to a description of more or less familiar products for the sake of telling what they are, and how they are made without sufficient regard to the methods of enquiry which have led to their discovery or preparation. Apart from this minor criticism, Prof. Findlay is to be thoroughly congratulated upon his work, which should do much to secure a fuller recognition of the achievements of chemical science and research in the service of man.

Charles A. Keane.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No. 7331. Telegraphic Address: Induchem, Finsquare, London.*]

THE TREATMENT OF CHEMICAL SUBJECTS BY THE DAILY PRESS.

A recent flagrant specimen of the unskilful treatment of a chemical topic by certain daily papers raises again the question of the methods generally adopted by newspapers in dealing with scientific and technical subjects. It is, indeed, only the latest of a long series of instances which might be quoted of the lamentable blunders that are committed when such matters are handled by technically unqualified writers and editors. Technical copy should before all things be accurate; but papers of a certain class have no use for a plain tale plainly told, and by them accuracy is invariably sacrificed to sensationalism. Little, if any, better is the "technical" information that is more or less directly connected with the advertising pages, whether from a company-promoting point of view or as a simple trade puff; in either case, to employ the lively mixed metaphor which once came to our notice, we can "see the cloven hoof of the man with the axe to grind, peeping round the corner." Such matter is usually fulsome and one-sided; it is often written up from particulars supplied by interested persons, and its bias and lack of proportion render it absolutely unreliable. Of a slightly higher class are the technical articles by "expert contributors" which figure largely as makeweight to a page or so of trade advertisements in a familiar type of special supplement: but these should really all be marked "Advt."

With the exception of motoring and engineering topics, which are regularly entrusted to experts, the quality of the technical articles and paragraphs in the daily Press is so poor that the discerning reader is impelled to remark: "If it cannot be done better than this, why not leave it alone altogether?" But can it not be done better? And can the organs of a vast commercial community afford to neglect such topics? It may be said that technical matters should be left to technical papers, where those that want them will know where to find them. But, for the sake of the advancement of the nation in technical efficiency, it is essential that a general interest should be maintained in the current development of scientific and industrial progress; and thereby let it not be forgotten, a great deal of extremely attractive copy may be provided. During the great banquet of the Eighth International Congress of Applied Chemistry in New York in 1912, the present writer heard Mayor Gaynor tender his apologies to the Congress for the small amount of notice which the New York papers had vouchsafed to its very important proceedings. Only a few minutes before, he had been pointing out to some American pressmen sitting near, what a number of capital "stories" they had missed in connection with, for instance, the fixation of atmospheric nitrogen, which might yet stand between mankind and starvation; the realisation of vast fortunes by the utilisation of waste products in, for instance, the cottonseed and soap industries; the fascinating combination of luck and skill exercised in the development of the synthesis of dyestuffs; and the militant rivalry of the producers of artificial indiarubber. The frank American boys candidly acknowledged their chagrin at having overlooked the powerful human interest latent in these themes. The fact is undeniable that the public fully appreciates any trouble taken to increase its store of knowledge concerning objects and processes with which it daily comes in contact and that the intelligent mind is forever keen to know the answer to the questions "What is it made of?" and "How does it work?" Is it fair that those who thus seek the bread of sound knowledge should be put off with meretricious claptrap?

If, however, such questions are to be duly and truly answered there must be a considerable alteration in the methods of the Press in dealing with them. The chief difficulty is that good technical writers are all too scarce. The expert contributor only too often comes under the profane condemnation assigned to the expert witness. He is either far too deeply immersed in his subject to make himself intelligible to the general reader; or he is a facile writer who can pour forth a flowing stream of words, wide enough in their scope, but most lamentably shallow and inaccurate. Of the two types the former is preferable, since solid fact is the essential basis whereon all permanent work must be founded. Only, between the weight of learning and the untrained understanding of the public, a qualified editor must know when and where to apply his blue pencil. This, however, is hardly within the scope of the limited omniscience of the ordinary news-editor. What is needed is for all the Press agencies to employ technical experts to keep them in touch with the latest developments in the principal branches of applied science; and for every paper that pretends to give information on such matters to maintain a list of acknowledged specialists to whom any articles or paragraphs in their particular branches may for a moderate fee be submitted; and such a list could readily be compiled from among the members of the Society of Chemical Industry. Only by these means can the public confidence be won and maintained; but it will be quite worth while if discreditable "stunts" may thereby be avoided and technical subjects can receive in our daily Press the full and serious consideration which they indubitably merit.

CARBIDE OF CALCIUM INDUSTRY IN GREAT BRITAIN.

CHARLES BINGHAM.

During recent times the only calcium carbide factory in Great Britain has been that constructed according to the plans of the writer at Thornhill in Yorkshire; but owing to the insufficiency of electrical power, this factory was removed in 1916 to Manchester, the buildings and equipment being incorporated in a much larger works. In the beginning of 1917, the Ministry of Munitions gave instructions to increase the productive capacity very considerably, and this additional work is now approaching completion.

The Manchester factory is, therefore, at the present moment the only calcium carbide factory in Great Britain.

There are also two small factories in Ireland, worked by current generated by water-power; but the supply of water is, in both cases, so small and so erratic that their combined output does not cover much more than one-hundredth part of the normal consumption in this country.

Up to the present, the current required for the factories manufacturing calcium carbide and similar heavy electro-chemicals, such as ferro-silicon, has usually been supplied from large generating stations, which have had to consume extra fuel (in the shape of coal or gas) for the

power required for the furnaces. In order to be able to charge as low a price as possible for the power, it has been customary to stipulate that the power-station shall have the right to reduce or cut off the supply during the peak-hours. But in any case such an arrangement obviously entails the consumption of an extra quantity of fuel, and it has therefore been customary to base the price for the current upon the average consumption of fuel per unit for the whole output of the power-station, with the addition of a small fixed amount to cover "over-head charges."

Such a method of fixing the price would, if no other supply of energy were available, make the outlook for manufacturing cheap carbide, etc., in this country exceedingly unpromising. It is clear that even with the most up-to-date plant and using very large units, an average consumption of much less than about 3 lb. per unit cannot be reckoned on, for, even with the electric furnaces to take the "non-peak" surplus of power, it is utterly impossible to reckon on a load-factor even approaching 100%. For fuel alone, at present prices, the actual cost already exceeds one-third of a penny at most large stations; and it is to be anticipated that, with the latest concessions to the colliers, the cost for fuel, plus over-head charges, now usually amounts to at least 0·4d. per unit.

To produce a ton of carbide, it is generally assumed that at least 4250 units are required, this figure including not only the current required for the furnaces themselves, but that absorbed by loss in the transformers and leads, for motors for crushers, elevators, pumps, drum-making plant, etc.

At 0·4d. per unit, the cost for current will therefore amount to £6 13s. 4d. per ton; whereas the cost in Norway, with cheap water-power, has usually amounted to 22s. to 25s. per ton. The extra cost for current in England to-day is therefore not less than £5 8s. 4d. per ton produced. As carbide was selling at £10 15s. per ton ex store in England just before the war, it is clear that a very high import duty would be necessary in order to place English manufacturers in a position to compete with Norway, unless:—

1. The cost for fuel is reduced very materially;
2. Or other, and very much cheaper, methods of producing electricity can be found.

It may be argued that Norway is handicapped by having to get its raw material for making the carbide (coke or anthracite) from this country, and by having to pay the freight on carbide back to England. Such is not the case. Under ordinary circumstances, the freight on anthracite to Norway is less than the railway rate from the Swansea district to a carbide factory, for instance, in Lancashire; while the cost of distribution, for the carbide itself, by steamer from Norway, was, before the war, less than half the cost of distributing by rail, or coasting steamer, from a factory in England.

As regards the probability of the cost of fuel being reduced, the writer believes that this must, in the long run, be the case; but it will almost certainly be a long and wearisome process.

The fact that the colliers have demanded that their war bonuses shall be converted into fixed wages is very significant as to what is likely to happen after the war.

It is therefore pretty clear that if the manufacture of carbide in this country is to be kept going on anything like a considerable scale, it is absolutely imperative to look for new methods, in order to secure current at prices more nearly approximating the cost in water-power countries.

In the writer's opinion, the most promising solution is the utilisation of waste gases, such as those from blast-furnaces and coke-ovens. But even here there are considerable difficulties, for even if the blast-furnace or coke-oven owners were willing to give their gas without charge, the working cost for the gas-engine-, or steam-turbine-plant for utilising it, plus depreciation and running costs amounted *before the war* to about 0·11d. per unit, equivalent to about £1 19s. per ton of carbide, as compared with 22s. to 25s. in Norway. As plant to-day costs very much more, it is practically certain that the figure of 0·11d. per unit is too low.

If, in addition, the gas has to be paid for, say, at the rate of only 2d. per 1000 cb. ft., competition against Norwegian water-powers would become still more difficult.

Modern large gas engines consume about 27 cb. ft. of coke-oven gas per K.W.-hour, so that the gas for the 4250 units mentioned above would cost 19s. 2d., giving, with other charges at £1 19s., a *pre-war* figure of £2 18s. 2d. per ton of carbide, or about twice as much as in Norway.

With the increased cost due to the war, it seems clear that, failing an import duty, a carbide factory desirous of catering for the large trade, such as the artificial manure and other industries which utilise carbide as their raw material, cannot afford to lay down a power-plant and also pay for the gas, and therefore it would seem that the best way of using such gases for carbide-making is to look out for collieries or blast-furnaces which already own power-plants and make arrangements for taking their surplus power on a profit-sharing basis.

Many large electric generating plants are already owned in this country by colliery and blast-furnace companies.

From data collected for some years, it is clear that such plants are very rarely utilised to their full capacity. It is obvious that such a plant must be constructed of sufficient capacity to cope with the maximum demand for current at any moment. It is also clear that the full capacity of the plant cannot be utilised continuously; for, in the case of a colliery, the winding plant, for instance, only works intermittently, while in the case of a blast-furnace, the demand for power is also irregular, especially if rolling mills form a part of the plant.

The figures in the writer's possession show that the load-factor of such plants rarely exceeds 50% of the maximum capacity, and in many instances sinks as low as 37%. In nearly every instance this means that a corresponding amount of gas (50—63%) is wasted, for gas-holders are practically never used. Moreover, the amount of gas produced by a blast furnace is so much in excess of the quantity required for the plant's own requirements that no necessity has arisen for the storage of gas.

Such blast furnaces or coke ovens have, therefore, a large amount of productive capacity unutilised; but it is only possible to supply it intermittently for other purposes.

It has been the general belief amongst carbide manufacturers that it is not possible to utilise an intermittent supply of electricity for making carbide. It has always been held that the result of intermittent supply has been to make the electro-thermic product of poor quality and increase the consumption of electrodes and raw material.

The writer has, however, been able to carry out experiments at four different factories, with furnaces using from 500 to 1000 K.W. per hearth, and, in one case, with two furnaces, of 1000 K.W. each, running alongside each other, and using exactly the same raw materials and electrodes.

One of these furnaces worked with a very steady load, not falling below 960 and not rising above 1040 K.W., while the other was worked with current varied to imitate a highly intermittent supply.

At first these experiments were, as is usually the case, not satisfactory, but later on, by making certain alterations in the transformers, the leads and the furnaces themselves, highly satisfactory results were obtained, the decrease in the output varying from only 1·35% under the most favourable conditions, to 6% where the form of intermittent supply was the most unfavourable.

There was only a very slight increase in the consumption of electrodes and of raw materials, the monetary value of the increases, at pre-war prices, amounting only to 2s. 8d. per ton.

The greatest difficulty, which had to be overcome, was to find suitable apparatus for varying the load on the furnaces quickly. It was found that regulation of the load by hand was not a satisfactory method.

This trouble has lately been overcome in a highly satisfactory manner.

The data obtained led the writer to have the strongest belief that it wll be possible in this manner to utilise the capacity of blast-furnaces and similar plants, in such a manner as to give a load-factor of nearly 100%; in other words, to enable, for instance, a blast-furnace or coke-oven concern to utilise its electric power station first of all for driving its own plant, and to turn any surplus over to the electro-chemical factory at the moment when it cannot be utilised for its own plant. In this manner Great Britain should be able to meet any competition from water-power countries: indeed, our country should be able to produce at a lower figure, for although there would be a little higher consumption of electrodes and raw material, the cost for the power itself would obviously be lower in cases where the electric-station already exists, and is unable at present to utilise the whole of its gas.

Another method also is suggested of obtaining cheap current in this country, viz., by coking certain classes of coal, recovering the by-products, and subsequently gasifying the coke. The idea is that the value of the by-products would cover the whole cost for the coal itself, and for the coking and subsequent conversion of the coke into power gas, so that in effect the gas would cost nothing.

While this idea is of interest as a war-time proposition, I find that well-known managers of large coke-oven batteries, with by-product plants, do not share the opinion that it is possible to generate current at a low figure in this manner. On the one hand they raise the objection that the estimated value of the by-products is based upon present war conditions, and that after the war, the bottom will drop out of the by-product market, owing to over-production, while on the other hand they believe that the cost of the plant for converting the power gas into current has been considerably under-estimated; that the experiments hitherto carried out are based merely upon a short experimental working; and that actual extended experience will show that the running costs, and especially the bill for repairs, will put quite a different aspect on matters.

The building of an installation on this system is already in progress, and it will be interesting to see whether the calculations of the promoters are borne out. In any case, however, even if the power gas is obtained for nothing, it is obvious that no advantage will be obtained as compared with waste gas from blast furnaces or coke ovens, so far as the cost of the gas is concerned. From the national point of view, on the other hand, the idea has two very serious drawbacks. In the first place a large amount of capital will have to be sunk in the plant for coking the coal, expenditure which may turn out to be unremunerative in the event of the price realised for the by-products proving to be less than anticipated, or, as seems more than probable, the cost for generating the current turning out to be higher than the promoters expect. Secondly, there will be a considerable waste of the national coal assets, as, even if a consumption of only 2 lb. of coal per K.W.-hour is realised, the 4250 units required per ton of carbide will necessitate the consumption of about four tons of coal for each ton of carbide produced.

THE PROFESSION OF CHEMISTRY.

THE INSTITUTE OF CHEMISTRY.

At the 40th Annual General Meeting of the Institute of Chemistry held on March 1, Sir J. Dobbie, the retiring President, said that the past three years had afforded unusual opportunities for demonstrating the utility of the Institute, and the special services which it had rendered in connection with the war had been widely acknowledged. It had done very valuable work in introducing suitable candidates for commissions in His Majesty's Forces, where technical knowledge and experience were required and in providing chemists for Government factories, controlled establishments, and laboratories engaged in war work. Every public department and every branch of the fighting services that required the aid of the chemist had made use of its services, and in this connection the names of thousands of chemists of various grades had passed through its registers. The Institute might fairly claim to have been the chief agent in mobilising the chemists of the country for war purposes.

Further, since the beginning of the war the Institute had been unremitting in its efforts to ensure to chemists a supply of pure reagents, glass, and porcelain.

The attention of the Council, however, had been very largely devoted to the revision of the Regulations for admission to the membership of the Institute, with a view to promoting the more complete organisation of British professional chemists. He hoped that means would be found of constituting the Institute the representative body of all properly qualified professional chemists, and that it should also undertake to maintain a register for others who were engaged in chemistry, but were not necessarily qualified for admission to the Institute as members. Such an organisation as they had in view would make it possible, when occasion demanded, for the chemists of the country to bring their whole weight and influence to bear on questions of national interest.

A number of motions referring to the Regulations for the admission of members of the Institute, in the names of Messrs. J. H. Lester and W. Marshall (Manchester) and Mr. W. Gathorne Young (Doncaster), were withdrawn on the understanding that an opportunity would be given for a full discussion at an Extraordinary General Meeting of the Institute to be held in the near future.

The officers and members of Council for the ensuing year were elected as follows:—President, Sir H. Jackson; Vice-Presidents, H. Ballantyne, W. T. Burgess, C. F. Cross, Sir J. J. Dobbie, A. Harden, Sir R. Robertson; Hon. Treasurer, A. G. Salamon. Members of Council, E. C. C. Baly, C. O. Bannister, O. L. Brady, H. C. H. Candy, A. C. Chapman, C. H. Cribb, J. T. Dunn, E. M. Hawkins, G. G. Henderson, P. H. Kirkaldy, H. G. Lacell, A. Lauder, J. H. Lester, F. J. Lloyd, W. Macnab, G T. Morgan, D. Northall-Laurie, G. H. Perry, F. M. Potter, W. Rintoul, H. Silvester, G. Stubbs, J. F. Thorpe, T. Tickle, L. E. Vlies, E. White, W. M. Gathorne Young.

A well-attended meeting of the members of the Institute of Chemistry resident in Scotland was held in the Royal Technical College, Glasgow, on February 23, the chair being taken by Mr. J. McLeod, Chairman of the Local Section of the Society of Chemical Industry.

The meeting adopted unanimously a resolution requesting the Council of the Institute to form immediately Local Sections throughout the country, and also a resolution to form a Scottish Provisional Local Section of the Institute. The following were then appointed to act as a Committee of the new body:—Mr. J. McLeod, Chairman; Prof. G. G. Henderson, Dr. C. H. Desch, Dr. A. J. Robertson, Messrs. J. G. Annan, B. D. Porritt, F. W. Harris, J. Sorley, J. Weir, W. W. Lumsden, and T. A. Wilson (Secretary) [Corporation Chemical Department, 20, Trongate, Glasgow.]

The principal business before the meeting was the consideration of the action of the Council in admitting 299 War Associates without examination. Prof. Henderson, as a member of the Council, justified the action of the Council, and claimed that no person had been admitted to the Associateship unless (1) he had produced evidence of having passed satisfactorily through the full course of training required of candidates for the Associateship, and (2) had been recommended from personal knowledge by a Fellow of the Institute or other responsible person.

Other members demurred to accepting evidence of training alone as sufficient to exempt candidates for the Associateship from a practical examination, and contended that, since the examination was more practical than academic, it would have shown the weakness of the claims of many of the War Associates to be considered trained practical chemists. Of the 299 War Associates, only about 50 were actually on service, and it was claimed that the others might at any time have submitted themselves for examination in the regular way, whilst the fact that they had not done so showed that they recognised their inability to satisfy the Board of Examiners as to their competency in practical chemistry: and that the fact that until then not less than 600 applications for admission to the Associateship had been received indicated that the applicants were keenly alive to the value of the Institute's hall-mark. Ultimately, the meeting unanimously adopted the following resolution:—

> "That the Scottish Provisional Local Section of the Institute of Chemistry calls upon the Council (1) to maintain the present standard of qualification required for elections to the Associateship or Fellowship of the Institute, and (2) to take such steps compatible with (1) as will result in the Institute becoming the recognised representative of the chemical profession in this country."

BRITISH ASSOCIATION OF CHEMISTS.

A largely attended meeting of chemists in the Edinburgh and East of Scotland area was held in the Cockburn Hotel, Edinburgh, on February 19, to discuss the proposed formation of a British Association of Chemists.

The meeting was convened by the Edinburgh and East of Scotland Section of the Society of Chemical Industry. In the absence of the Chairman of the Section (Mr. Dott), Mr. J. Rutherford Hill was asked to preside.

Dr. Laud r gave a short account of the movement which led up to the meeting of chemists in Manchester in November, 1917, when a provisional Committee was formed to draft a constitution for the proposed new society and to get into touch with the Institute of Chemistry. The present position of the negotiations between the provisional Committee and the Institute of Chemistry was explained and prints were handed out giving in detail the proposals of the Executive Committee to the Institute of Chemistry and the reply of the Institute to these proposals.

Mr. J. B. Robertson considered that the Institute of Chemistry had not pursued a sufficiently active policy in the past and that a large infusion of new blood was necessary. He feared that the new members might not have a sufficient voice in the policy of the Institute for some time to come.

Mr. B. D. W. Luff thought that for any new society to be effective it would be necessary to have legislation and to get authority from Parliament to get control over its members. He instanced the case of the Law Society and the General Medical Council.

Dr. Watt thought legislation would be impracticable at the present time and quoted the difficulties which had occurred when the Pharmacy Act and the Act relating to the registration of dentists came into force. He said that every one who "had blown water through a wash-bottle" would demand to be registered as a chemist.

Professor Walker pointed out that the qualifications foreshadowed were much too vague, and that a candidate might comply with these regulations and yet have only a very general training in chemistry. He suggested that it might be amended to "a University Degree in Science."

Considerable discussion then took place regarding the difficulty of defining a "Chemist," and Mr. J. Rutherford Hill read a memorandum explaining the effect of the Pharmacy Acts upon the use of the title "Chemist." (See below, p. 89 R.)

Dr. Dobbin pointed out that some of the proposals of the new Association were very vague in character, *e.g.*, What exactly is meant by the "Institute of Chemistry broadening its scope"? He considered the proposals of the Institute not sufficiently liberal and doubted very much whether they would satisfy the promoters of the British Association of Chemists. He urged the Institute to endeavour to greatly increase its membership, and suggested that in addition to the Associateship and Fellowship a new class of members might be created. At the same time he made a strong plea for unity and strongly deprecated the founding of a new Society.

The following Committee was appointed to represent the chemists of the Edinburgh and East of Scotland district:—Prof. Walker, Drs. Lauder, Watt, Knox, and Drinkwater; Miss Scobie; Messrs. J. G. Annan, C. N. Kemp, B. D. W. Luff, J. B. Robertson, B. D. Porritt, and E. Anderson.

At a meeting of the Council of the *National Association of Industrial Chemists* held in Birmingham on March 2, the following were appointed Members of the Executive:—Messrs. W. Hargest (Newcastle), G. W. Thomas (Scunthorpe), R. Blackwell (Birmingham), F. N. Harrap (London), W. J. Davison (Middlesbrough), and T. F. Russell (Sheffield).

Corrigendum. In the account of the meeting of the "Sheffield Association of Metallurgists and Metallurgical Engineers" in our issue of February 15 (this J., 1918, 52 R), Mr. F. K. Knowles was reported to have raised the question of possible clashing between the activities of this Association and those of the proposed British Association of Chemists. This was incorrect; the reference should have been to the "Sheffield Society of Engineers and Metallurgists." The Metallurgists' Association is actually acting locally for the British Association of Chemists.

MEMORANDUM ON THE TITLE "CHEMIST."

(*Abbreviated.*)

J. RUTHERFORD HILL.

There is a very common misunderstanding running through all the discussions with regard to the title "Chemist."

It is assumed by some that an analytical, or research, or teaching, or technical, or works or wholesale manufacturing chemist has no lawful right to use the title "Chemist" and could be convicted of a contravention of the Pharmacy Acts which regulate the sale of poisons. This is a complete mistake. The Pharmacy Acts do not constitute a universal prohibition of the use of the title "Chemist" as, for example, the Medical Acts do in the case of the words "Physician" or "Surgeon", and the Dental Act does in the case of the word "Dentist." The Pharmacy Acts only strike at the use of the title "Chemist" by a person selling poisons by retail or keeping open shop for retailing poisons who is not registered under the Pharmacy Act, 1868, as amended by the Poisons and Pharmacy Act, 1908. Outside that strictly defined limit the word "Chemist" is absolutely as free as any other word in the English language and can be used by any person whatsoever. This is clearly brought out in the cases Bremridge v. Hume and Bremridge v. Turnbull in the High Court of Justiciary in November, 1895 (Pharm. J., Nov. 2 and 9, 1895, 371, 396). In these cases the titles "Technical Chemist" and "Photographic Chemist" respectively were used on shop signs and in catalogues in connection with open shops where poisons were sold retail to the public.

Lord Salvesen (then acting as senior Counsel for the Registrar who prosecuted) said :—

> "Mr. Dundas, for respondent, says it is a necessary result of my argument that if Dr. Stevenson Macadam called himself an Analytical Chemist he would be struck at by the provisions of the Statute. That is not so. Your Lordships see the connection in which the prohibition appears in Section 15, which commences 'All persons keeping open shop, or who shall take, use or exhibit the name or title of Chemist,' and so on, not being qualified under the Act. It might be a very fair construction of the Section to say that it applies only in the case of persons keeping open shop for the retail of poisons. Now Mr. Hume and Mr. Turnbull come within that category. No one would suggest here that this would prevent Dr. Stevenson Macadam putting on his card 'Analytical Chemist.' The harm appears in putting it above a shop door where poisons coming under the Pharmacy Acts are sold in a pure state, and it is because of that combination of circumstances these prosecutions are raised. The Pharmaceutical Society would never prosecute anyone for simply calling himself Analytical Chemist. The mere name put by a gentleman on his card—by a person who does not sell poisons at all—would not be an offence against the Statute."

It was my lot to be in Court all the time both before the Sheriff and in the High Court as representing the Registrar, and therefore I could see that this view satisfied the Court and particularly Lord Trayner who gave the leading judgment, and who, both by word and gesture, indicated that he could not for a moment accept the view that the use of the title "Chemist" by a professional teacher of chemistry and an analyst like Dr. Stevenson Macadam was prohibited by the Pharmacy Acts.

There is another common misunderstanding that needs to be cleared up. In almost all these discussions there is a suggestion that the Pharmacy Acts are intended to deal only with the practice of pharmacy and the sale of drugs and medicines. That is quite a mistake. The business of a chemist and druggist has never been limited in that way and is very much wider in its scope. The mistake may have arisen from the fact that the original Pharmacy Act of 1852 dealt only with the use of titles by persons carrying on the practice of pharmacy and has nothing whatever to do with the sale of poisons. Hence the only titles restricted by that Act are those of "Pharmaceutical Chemist" and "Pharmaceutist."

Prior to 1868 there was a great public agitation for legislative restrictions on the sale of poisons. Many tragic poisoning cases had occurred, both criminal and accidental. To a very considerable extent the poisons concerned were not drugs or medicines but substances used for technical or manufacturing or domestic purposes; not infrequently vermin-killers, insecticides, or disinfectants. Parliament determined to regulate the retail sale ofall poisons for whatever purpose required.

It was accepted as fundamental that the education of the vendor is the only safe foundation for a Poison Bill. Parliament found a body of trained men already the chief retail vendors of all the poisons in question, and giving a public guarantee of a competent practical knowledge of pharmaceutical and general chemistry and other branches of useful knowledge. Their fitness having been certified by a Statutory Board of Examiners under the sanction of the Privy Council they were registered under the Pharmacy Act, 1852, and could thus easily be recognised and controlled.

Here was the very body of persons answering to the fundamental condition of a safe and efficient regulation of the retail distribution of all scheduled poisons. Parliament therefore in 1868 recognised this body as the sole statutory retail vendors of all poisons whether for medicinal, domestic, technical, or sanitary purposes. The so-called Pharmacy Act of 1868 was therefore in reality what its fuller title implies :—

> "An Act to Regulate the sale of Poisons and Alter and Amend the Pharmacy Act."

That the Pharmacy Acts since 1868 have this wider application is made perfectly clear by reference to the Schedule of Poisons which include such articles as, for example, cyanide of potassium, oxalic acid and vermin-killers, which are never used as medicines.

It is in this 1868 Act that for the first time the use of the title "Chemist" by itself is prohibited in connection with the sale of poisons by any person not duly registered under the Act. Neither the word "Druggist" nor the word "Pharmacist" adequately describes a person entitled to carry on the business subject to the restrictions of the Pharmacy and Poisons Act. His business includes the retail vending of substances used for scientific, technical, and domestic purposes; he is certified to possess a competent practical knowledge of general chemistry and is, as a simple matter of fact, a chemist as well as a pharmacist. But he claims no exclusive right to the use of the title "Chemist" and the Pharmacy Acts do not give him such an exclusive use. Whenever the common law right to the use of a title is interfered with, however, the recognition of vested interests should be provided for. This was done in the case of the Pharmacy Act of 1868 when every person actually using the title or carrying on the business to be restricted was, if they so desired, placed upon the Register. The same was done in the case of the Dentists Act of 1878. That meant that both in the case of the Pharmacy Act and the Dentists Act a large number of persons were registered who certainly could not have satisfied the examiners that they possessed such competent skill and knowledge and qualification as these Acts require to entitle any person to registration.

CORRESPONDENCE.

THE PROFESSION OF CHEMISTRY.

SIR,—After having carefully read much of the literature which has appeared upon the above subject, one is forced to the conclusion that at present the views of the various promoters do not agree. Before therefore any real progress can be made it is necessary to clear away these differences. One body asks for a registration of all chemists, others speak of a registration of *qualified* chemists. The introduction of this term clearly makes an immense difference in the aims of the two parties.

As no body can hope to include all qualified chemists as distinct from unqualified chemists, it would appear that the original movers of the Manchester meeting were wise in suggesting a registration of all chemists. This would simply mean the publication of a suitably grouped and subdivided register of all chemists properly classified, but it would give no guarantee as to the qualification of those on the register.

The construction of such a register would, of course, raise the question as to who is a chemist. It is remarkable that all the meetings held have resolved that it is desirable to define a chemist, but not one has attempted to do so. After very careful consideration the following appears to best satisfy the demand. A chemist is one who is or has been engaged (or permanently engaged) in the application of the science of chemistry. The definition has been criticised especially by those who want to insist upon a qualified chemist. They ask what evidence is there that a man is entitled to call himself a chemist? May not one legitimately reply that a man who has permanent employment in, and can earn his living by, the application of the science of chemistry is as much entitled to the name of chemist as one who knows the theories of chemistry and gains his livelihood by teaching them to others. Each man has his function. Neither could take the place of the other; yet each is a chemist.

Who ought to form this register? One would have thought the Institute of Chemistry was the right body, but so far as one can judge the Council of the Institute is not prepared to undertake this task. The only other organisation at present in existence which appears capable of doing it is the Society of Chemical Industry. Failing that Society taking the matter in hand, it seems inevitable that still another body must be formed for the purpose.

Is it worth doing? There would appear to be several advantages which might possibly accrue from the formation of such a register, which may be classified as social and political. The chief social advantage would be the effect upon the public mind which the publication of such a register would have. At present very few people realise, much less know, what a vast army of workers is engaged in the application of chemistry, of the extent to which every industry in the country is dependent upon chemistry, and how intimately the welfare of the country is bound up with the success of these industries. The chemist would, for the first time in the history of this country, become a social factor.

The political effect of such an organisation as would be implied merely by the formation of the register, though it is to be hoped it would not end here, would enable such pressure to be brought upon Parliament as to ensure a proper definition of the term "Chemist" and the right recognition of the "Qualified Pharmacist." Pharmaceutical chemists should be on the register as such, and should be willing to help to obtain a right definition of the term "Chemist" which would not belittle their special qualifications as pharmacists. Amongst other objects, one of outstanding importance for the future of this country would be the power this new body would in time exercise to promote or to prevent legislation affecting the chemical industries. If only to attain this end it would appear that the formation of a register of chemists is not merely desirable, but essential, not only for chemists as a body, but for the country as a whole.

I am, Sir, etc.,

Feb. 18, 1918. F. J. LLOYD.

SIR,—One effect of the war has been to force on the public notice the vocational aspect not only of chemistry but of other branches of science. Before the war there was nothing like a conscious public demand for scientific help and one may reasonably fear that the present need is only regarded as a "war emergency." It is highly necessary for professional men and particularly for chemists to consider their relations with the public and with one another and to organise themselves accordingly.

A question which affects both the public and chemists themselves is "Who shall be allowed to call themselves chemists?" Surely all those who actually practice chemistry as a vocation in life are entitled to do this. The present is a particularly favourable time for union on some such broad lines.

The Institute of Chemistry has done a great work, although, perhaps wisely, in a rather limited way. Will it continue to represent only part—a very select and highly respectable part—of the chemical community, or will it rise to the full meaning of its great name and organise the profession of chemistry? Dissatisfaction and disappointment are expressed by many earnest speakers at B.A.C. meetings. The Institute does much better for them than they know, but as it necessarily does much good by stealth its critics can hardly be blamed for their ignorance. One thing they seem to be certain of—that something is wanted for chemists which existing bodies do not supply.

The Council of the Institute does not deem it advisable to become the sole registration authority for chemists, as proposed to it by the B.A.C. It could, perhaps, prepare a register of chemists on a vocational basis without necessarily admitting to its membership all persons so registered. Representatives of the whole body of chemists thus registered could then agree on a basis for future registration. Probably graduates in science, associates of certain colleges, and members of the Institute would, *ipso facto*, be entitled to registration, and for a few years other persons of experience with less definite qualifications.

It would be an advantage to the public and to chemists to know that there was available a list of chemists, and that absence of a name from that list was strong presumption that the owner was not a chemist. There is no such list at present. Will the Institute prepare one or if it cannot will the B.A.C.?

Chemistry has not yet taught us how to synthesise our proteins or to obtain our calories from gratuitous inorganic materials, and hence the economic interests of chemists need consideration. The Institute, as its Registrar has stated, is not, and for the reason he gives perhaps cannot be, a trade union. The B.A.C. apparently is not one. The only such body I know available for the younger professions is the National Association of Scientific Workers. I advise all chemists to follow the example of the honoured profession of medicine and to attach themselves to such a body. By so doing they may be able to get as good recognition and remuneration as skilled mechanics are able to demand and obtain.

I am, Sir, etc.,

March 3, 1918. J. H. COSTE.

OBITUARY.

THOMAS TYRER.

BORN 1842. DIED FEB. 21, 1918.

The death of Thomas Tyrer will be a cause of sorrow and regret to a very large number of members of the Society of Chemical Industry. From the date of its foundation in 1881 to the very day of his death, Thomas Tyrer made the Society and its affairs a part of his own existence, so that nothing of importance affecting the Society happened in which he had not a hand, and no one who has taken any prominent part in its affairs has failed to come into intimate contact with "T. T.," as he was fond of calling himself.

Thomas Tyrer was born at Wolverhampton in 1842 and was educated, first at his father's School and afterwards at the Royal College of Chemistry, where he studied under Hofmann. On leaving the College in 1862 he became works chemist to Messrs. May and Baker, manufacturing chemists, of Battersea, of which firm he eventually became a partner. In 1890 he retired and purchased the business of Dunn and Co., manufacturing chemists, of Stratford, which he continued under the title of Thomas Tyrer and Co., converting it into a limited liability company in 1898.

In 1881 Tyrer took a prominent part with George E. Davis, Roscoe, Abel, Ludwig Mond, Spiller and others in the foundation of the Society of Chemical Industry. He was for the first 10 years of the Society's existence Honorary Secretary of the London Section and, later, Chairman. In 1896-7 he was President of the Society, and in 1908 he became Treasurer, an office he continued to hold to the day of his death, whilst all the time from 1881 and onwards he served the Society in one capacity or another. In 1891, at the end of his 10 years' service as Secretary of the London Section, and under the presidency of Sir Frederick Abel, he was presented with a silver salver and a purse of gold, and in 1910 the medal of the Society was awarded to him in recognition of the distinguished services which he had rendered to it from the date of its foundation.

Thomas Tyrer's energies, however, were not monopolised even by the Society of Chemical Industry, and his business as a manufacturing chemist. As Chairman of the Chemical Trade section of the London Chamber of Commerce he took part with David Howard, Charles Umney, and others in bringing about the grant of duty-free spirit for medicinal and other alcoholic preparations, perfumery, etc., sent abroad, thus enabling the English manufacturer to compete with other countries for foreign trade in these articles. This boon was granted in the form of a drawback of duty on exportation under what is known as the "Tincture Regulations." Not content with this, Tyrer agitated for many years for the use of cheaper alcohol for industrial purposes. By denaturing with crude methyl alcohol, Great Britain had shown the world how duty-free alcohol could be made available for industrial use. It was contended, however, that for many purposes such alcohol was too impure and that in any case the cost of the 10 per cent. of wood spirit which was required unduly raised the price. Ultimately the Industrial Alcohol Committee, with Tyrer as a member, was appointed to consider the question, and as a result of their deliberations pure duty-free spirit was granted for research conducted at recognised teaching institutions, the general denaturant for industrial alcohol was reduced from 10 to 5 per cent., statutory authority was obtained for the special denaturing of alcohol, *i.e.*, for the use of other denaturants than wood spirit where "methylated spirit is unsuitable or detrimental," and a special allowance was granted on methylation to meet the enhancement of cost due to excise restrictions. As a recognition of his services in this cause Tyrer was presented with an address and a silver tea and coffee service as a token of "esteem and gratitude for the arduous, unselfish and disinterested manner in which he had worked for many years to the benefit of chemical industry in the United Kingdom and especially for the efforts to obtain untaxed alcohol for industrial purposes."

In addition to his association with the Society of Chemical Industry and the London Chamber of Commerce, Tyrer was also a Fellow of the Institute of Chemistry and of the Chemical Society, and a past President of the British Pharmaceutical Conference.

Personally, Thomas Tyrer was a kindly, genial soul. Though possessed of a certain tenacity, as his labours in connection with alcohol perhaps show most plainly, he would probably pride himself chiefly on his skill in smoothing difficulties and avoiding rupture. His friends will all remember his frequent references to "diplomacy." This trait enabled him to do and to promote much useful work and to evade the shafts of malice and envy. In business affairs he was upright and reliable and, as an employer, just and generous. After nearly 50 years of wedded life he lost his wife two or three years ago, and it was only during this period that his usual good health became somewhat impaired. His sight failed and recently he had undergone an operation for cataract from which, however, he appeared to make a satisfactory recovery. In spite of sight difficulties he continued practically all his work, and it was perhaps characteristic that he was in the office of the Society of Chemical Industry on the evening of his death.

May we all live as useful a life as Thomas Tyrer and be permitted, like him, to continue our work to the sunset hour!

E. GRANT HOOPER.

OFFICIAL NOTICES OF THE SOCIETY.

ANNUAL MEETING, 1918.

The Council has accepted the cordial invitation of the Bristol and South Wales Section to hold the next annual meeting at Bristol. The Senate of the University has generously placed its buildings at the disposal of the Society for the occasion.

PROPOSED ASSOCIATION FOR REFRACTORIES RESEARCH.

The provisional committee appointed to draw up a scheme for a proposed association for refractories research has now drafted a preliminary prospectus in which is outlined a suggested constitution for the proposed association. In drafting the prospectus the committee has been in consultation with the Department for Scientific and Industrial Research, and it now proposes to lay the scheme before a selected number of firms and individuals interested in the subject and likely to become members of the proposed body. The Council of the Society of Chemical Industry has been asked to assist the provisional committee by furnishing it with the names of such firms and individuals; and this notice is inserted in order that any members of the Society who desire to attend a semi-public meeting (to be called later) for the purpose of deciding upon the formation of the association shall send in their names to the General Secretary of the Society as soon as possible.

NEWS FROM THE SECTIONS.

LIVERPOOL.

A meeting was held on February 15 at the University when Dr. T. L. Bailey delivered an illustrated lecture on "The Manufacture of Tinplate": Mr. John Gray was in the chair.

Tinplate, which consists of sheet iron, or more properly mild steel, protected with a thin film of metallic tin, is used in large quantities for casing petroleum, as well as for "canned" food, confectionery, tobacco, etc. Over a million tons of steel, and about 16,000 tons of tin, are used annually for these purposes. The tinning of iron sheets on any scale began in the early part of the 17th century in Saxony and Bohemia; in the latter part of the same century it was made to some extent in England, but the industry did not flourish here until 1720, when it spread from a single works in Monmouthshire over the whole of South Wales, to which district it is mainly confined at the present day. Réaumur in 1725 described the earliest methods of making tinplate in which iron bars (1 in. square) were hammered out into thin sheets, which were cut to size by hand-shears, then scrubbed with sandstone, and pickled for two days in water rendered acid by means of fermenting barley meal; the pickled plates after being cleaned with sand were well washed and finally coated with tin. The tinning of the sheets was effected by first immersing them in molten palm oil; they were then transferred vertically to a bath of molten tin, thoroughly brushed with hempen brushes, and finally immersed in a second bath of molten tin covered with a layer of tallow. After excess of tin had been removed in a grease-bath, the tinned sheets were cleaned and hand-polished with sawdust and moss.

Modern tinplate processes differ from the above in that machinery has been extensively introduced, and furnaces and rolling mills are used, five separate heatings and rollings being usually necessary to produce the requisite gauge of sheet. "Black pickling," or immersion of the sheets in dilute sulphuric acid (heated by steam), is then resorted to in order to remove the scale of oxide formed during heating, and this is followed by "black annealing" for 10—12 hours in special furnaces. The sheets of "blackplate" are now "cold rolled," thus attaining smoothness and polish; "white annealing" follows, and takes about 7 hours. After a second pickling (of short duration) in sulphuric acid, the sheets are thoroughly washed in water, and are then ready to receive the coating of tin.

In tinning, hand labour is now dispensed with as far as possible, and pairs of revolving rolls at various positions guide the sheets on their way through the tin-pots, which may be of the double horizontal or vertical type. The tinned sheets are now passed on to a cleaning machine, which carries them twice through a mass of bran or of "pink meal" (mainly gypsum), from which they are delivered to a battery of dusting rolls, covered with sheepskin, and alternately geared to different speeds to ensure a polishing action on the surface of the finished sheets.

Among many problems arising in the modern tinplate process, one especially calls for chemical investigation, viz., the treatment of the dross which collects on the surface of the molten tin in the tinning-pot, which is technically called "tin-scruff." It is a complex mixture, which may contain 50 per cent. or more of metallic tin, together with chlorides of tin and zinc (zinc chloride is used as a "flux"), iron and sulphur compounds, together with palm oil and its decomposition products. The "scruff" is collected and smelted for the recovery of the tin it contains. As the first step in the treatment (that of liquation) was usually carried out in reverbatory furnaces, of which the temperature was inefficiently controlled, large quantities of acid fumes were often evolved from the short (20-ft.) chimneys then in use, and this led to an inquiry under the "Alkali Act" of 1906. The author was responsible for the introduction of depositing-flues and wash-towers which considerably mitigated the escape of obnoxious fumes in the neighbourhood of the larger works, and the economical recovery of the tin was made practicable by temperature control.

A self-contained method of complete "scruff" treatment, together with chemical control of all the operations of tinplating, is a desideratum yet to be attained. Although during the past few years patents have been taken out in connection with the treatment of tin-scruff (H. J. Bailey, 1909; J. Stephens, 1909; S. B. Bowen, 1912), no progress has been made in these directions, and in view of the general lack of chemical control in tinplate works, it can scarcely be expected.

NOTTINGHAM

At the meeting held at University College on February 20, the Chairman referred to the loss the Section had sustained by the sad death of Mr. C. E. B. Merriman, who met his death by the explosion of a barrel containing benzol. Deceased was assistant works manager at the Island Street Department of Messrs. Boots, Ltd., and had been a member of the Sectional Committee since 1913.

Mr. B. Collitt then read a paper by himself and W. Regan on "The Analysis of Aluminium Alloys."

After referring to the present-day importance of alloys of aluminium containing small quantities of copper, iron, zinc, manganese, and magnesium, the authors gave an account of some properties of these alloys, and of the methods in vogue for estimating their metallic constituents other than aluminium. An interesting property of aluminium alloys is their "diffusivity" for heat, which has an important bearing on their use for the pistons of aeroplane engines.

For analysis, the alloy is boiled with sodium hydroxide solution, which dissolves the aluminium and zinc, if present, leaving the other metals in the residue. The copper is estimated volumetrically by the iodide method, after the addition of sodium fluoride to the solution to form non-ionised ferric fluoride: the iron, reduced by stannous chloride, is titrated with permanganate in presence of manganese sulphate and phosphoric acid; the zinc is precipitated as sulphide; the manganese is oxidised to permanganate by sodium bismuthate, and titrated with arsenite, and the magnesium is estimated as pyrophosphate.

In the discussion which followed, Messrs. Richmond, Prideaux, Adams, Wilkie, Grisley, and T. Gray took part. The suggestions made included the use of densities, magnetic properties, and hydrogen evolution, for purposes of differentiation, together with certain modifications of analytical procedure.

The paper by Mr. E. Millington, Metallurgist to the Midland Railway Co., on "The Influence of small Quantities of some Metallic Elements on the Mechanical Properties of Brass," and the discussion on "Bleaching and Dyeing under War Conditions," to be introduced by Mr. S. J. Pentecost, were postponed to a future meeting.

LONDON.

At the meeting of the London Section on March 4, the Chairman, Dr. Charles A. Keane, referred to the great loss which not only the Section but the Society as a whole had sustained through the sudden death of Mr. Thomas Tyrer. In the tributes which the Chairman and Mr. Walter F. Reid paid to Mr. Tyrer's memory, it is not too much to say that they merely voiced the feelings of everyone who had ever come in personal contact with him. His high sense of duty, his courtesy and the kindly interest he took in everyone, especially younger men, will long be remembered by all who knew him. As a tribute to his memory, the following resolution is placed on the minutes of the Section: "That this meeting of the London Section of the Society of Chemical Industry hereby records its profound regret at the death of Mr. Thomas Tyrer, on February 21, 1918, and desires to place upon record its recognition and appreciation of the outstanding services he rendered to the Section from its initiation in 1881 until the time of his death.

"During this long association with the work of the Society, Mr. Tyrer acted as the Honorary Secretary of the Section for the first nine years (1881—1890), and subsequently as Chairman from 1890—1892. He served also as a member of the Committee on numerous occasions, in addition to his having occupied the high office of President of the Society for the Session 1897—1898, and that of Treasurer for the last ten years.

"As one of the founders of the Society, and as a pre-eminent contributor to the development and success both of the London Section and of the Society as a whole, Mr. Tyrer gave invaluable service. It is no exaggeration, we feel, to record that there has been no one associated with the Society who worked with greater zeal or with more self-denial in the promotion of its interests, which formed so full a part of his life's work. He gave to it not only the wise counsel of ripe experience, but by his remarkable activity and personal enthusiasm stimulated all associated with him in the furtherance of its aims and activities.

"We accordingly feel it to be fitting that this tribute to his labours should be formally recorded on the minutes of the Section."

The Chairman announced that the annual meeting of the Section, at which new members of the Committee are elected, will take place in May, but at present it is not certain whether the elections will be made under the old or new rules, as the assent of the Council has not yet been received to the latter.

The first paper was by Prof. W. R. E. Hodgkinson, on "Some Reactions of Acetylene." Many metals when heated in a current of acetylene cause it to decompose, with the production of carbides of the metals and the deposition of "soot" in the colder portions of the tube. This deposit, however, is apparently never pure carbon but invariably contains very appreciable quantities of the metals. Cobalt, nickel and iron are specially reactive with the gas, and in the case of the last-named carburisation occurs to a considerable depth, so that the physical properties of the metal after treatment are extensively modified and approach those of steel rather than iron. In many of the experiments, on account of the objectionable properties of acetylene, the gas was diluted with ammonia gas; under these conditions a smaller deposit of soot was obtained and carburisation was more rapid. With benzene, naphthalene and similar compounds the amount of the deposit was increased and also the proportion of the metal contained in it.

The second paper was on "Acid-resisting Iron and its Uses in Chemical Plant," by Mr. S. J. Tungay. In the past, the chemical engineer was mainly dependent on glass and stoneware for the construction of those parts of plant which had to resist the action of acids, but the fragile character of these materials and their inability to withstand changes of temperature were serious limitations to their employment and the prospect of obtaining some metal or alloy which was acid-resisting offered a promising field for enterprise. Apart from relatively pure iron in the "passive" state, it has been known for some time that alloys of iron with silicon or chromium were acid-resisting. Broadly speaking, an alloy of iron with about 12—16 per cent. of silicon is scarcely attacked by sulphuric, nitric or hydrochloric acids, but beyond that percentage of silicon the alloy is slightly less resistant. The carbon and phosphorus should also be low, otherwise on cooling these components tend to form eutectics which give rise to "blow-holes" in castings. The author showed an interesting table giving some physical constants of ordinary cast iron and acid-resisting iron. The ratio of the heat conductivity of the former to that of the latter is as 10 is to 8, whilst the hardnesses of the two are as 24 to 35. This latter point and the natural brittleness of alloys with a high silicon content, have been responsible for some of the technical difficulties experienced in the application of acid-resisting iron which has been found more difficult to machine, apart from the fact that its contraction is about three times that of cast iron. It is generally considered inadvisable also to employ the material for large vessels which have to withstand internal pressures above 50 lb. per sq. in. Nevertheless, during the last few years, during which the demand for acid-resisting alloys has been exceptionally great, a very marked advance has been made in the industry, and the success attained is a high tribute to the determination with which many workers in this very difficult field have grappled with the problem.

MEETINGS OF OTHER SOCIETIES.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At the meeting of this Institution held on February 19, a paper was submitted by Mr. E. H. Cunningham Craig, Dr. F. M. Perkin, Mr. A. G. V. Berry, and Dr. A. E. Dunstan, on "A New British Oil Industry," which dealt with the possible increase in the home production of motor spirit and navy fuel oil by utilising the large deposits of cannel coals, torbanites and blackband ironstones found in this country. The two former are to a great extent waste products in coal mining, being either left on the floor or as a roof in the pit, or, if brought to the surface, are separated from the coal and thrown on the waste heaps, while the latter is denuded of its hydrocarbon content before smelting, by wasteful burning in open bings.

Mr. D. V. Hollingworth has recently shown that by his patent process the oil contents of blackband ironstone can be removed by distillation, and that the ironstone-cum-fixed carbon residue which he calls "carbousiron" is in better condition for smelting than the product from the open bings, besides effecting a saving of fuel to the extent of about 4 cwt. of coke per ton of ironstone.

Many seams of a composite nature containing coal, ironstone and torbanite cannel are known in which the ironstone and coal are too thin to pay for working, while there is no sale for them as cannel; the author proposes, therefore, that such

seams, as well as the cannel, bastard cannels and torbanites, should be worked by low temperature retorting for the home production of oil. An average production of oil from these sources would be from 20 to 30 gallons per ton, which would require the retorting of 12,000 to 15,000 tons per diem for the production of about 400,000 tons of fuel oil per annum. To obtain this quantity of creosote oil, which is advocated for navy fuel purposes, would require the retorting of about 120,000 tons of coal per diem, as carried out by present gas works or coke oven methods.

In low temperature retorting, the temperatures employed are from 450° to 550° C., this range of temperature giving the largest oil production, with comparatively little permanent gas, and leaving a carbonaceous residue suitable for utilisation as a smokeless fuel in open ranges. This residue may, however, be further utilised in producers, for the recovery of the nitrogen content as ammonium sulphate, and of power gas.

The liquid products from low temperature carbonisation, consist mainly of substances of the aliphatic series, methylated phenols, fatty bases and solid paraffins, and the sulphur content is low at 0·4%—0·1 per cent. On refining, the oil gives approximately :—Motor spirit 6—9%, intermediate oil 6—8%, fuel oil 62—68%, paraffin scale 5%, pitch 8—9%.

The paper being taken as read, a very lengthy discussion took place, which, unfortunately, did not elucidate such necessary points as the actual quantities in sight of the propesed crude materials and the costs of retorting and refining.

The Chairman, Mr. Chas. Greenway, in opening, stated that the subject is of national importance and the Government would welcome information on it, a complete case not having been made out for the practical and commercial sides.

Mr. Hollingworth followed with details of his process (*v.s.*), stating that there are millions of tons of "lean ironstones" in Staffordshire which are at present not worked owing to their poverty in iron, but which by his process could be profitably exploited. Mr. Burls took exception to the quantities quoted and maintained that they were largely in excess of the actual figures. Sir Boverton Redwood gave results of experiments made in conjunction with Dr. Perkin and Mr. Rosenplaenter in 1913-14 on the retorting of cannel coal at low temperatures in which were obtained 50 gallons per ton of good quality oil. This, with suitable refining and cracking of the lighter oils, gave 14—15 gallons of motor spirit, 14—15 gallons of fuel oil, 32—33 lb. of paraffin wax and 4 lb. of pitch per ton.

Mr. Hill contended that the distillation of cannel coals failed in North Staffs owing to lack of financial support and costs of mining, and that the figures as to costs given in the paper were much too low.

Mr. Taylor then submitted a proposal to the effect that he represented a body which was willing to find half the necessary cash for the erection of retorting plant to deal with 10,000 tons of cannel per day providing the co-operation of colliery owners and the sympathetic consideration and support of the Government authorities with regard to the requirements of iron and steel were obtained.

Mr. Tod stated that no financial backing could be expected for a process which, if successful, would be taxed to the extent of 80 per cent. of its profits, unless this tax could be waived for, say, 5 years at the commencement. Mr. Lamplough gave figures showing the effects of distilling cannel with superheated steam, claiming that this method was more easily controlled, and cheaper in costs and plant than either internally or externally-fired retorts. Professor Cadman took exception to the title of the paper, stating that the distillation of cannel coal was not new as it was done in Frankfurt in 1695 by Becher ; also the authors might have given more consideration to the question of suitable types of retorts. Referring to blackband ironstone, he stated that the method of treating it in open bings had certain advantages not given by the "carbousiron" process, and thought that the figures given comparing the relative costs of shale and cannel were unreal.

Mr. H. Manfield stated that, generally speaking, the lower the temperature of retorting the better the yield and quality of the oil produced.

Sir Lionel Phillips said that much was being done by the Government for the production of oil in this country, but the work required time, patience and labour, and the expected results must justify the costs.

Mr. Cunningham Craig and Dr. Perkin, in reply, stated that the modern methods of low temperature retorting are new, and quoted figures showing the saving of iron and steel which could be accomplished by retorting cannels as against building tankers for the transport of the same quantity of fuel oil.

Mr. Greenway, in summing up, remarked that the main points which required elucidation were the question of available shale and costs of production, and suggested the formation of a committee composed of two each of the following :—Colliery owners, petroleum technologists, commercial men, and carbonisation engineers, which should go fully into these matters and report upon them.

E. L. L.

COKE OVEN MANAGERS' ASSOCIATION.

Before the Midland Section of this Association at Leeds on February 23, Mr. J. W. Lee (Grassmoor, Chesterfield) in the chair, a paper was read by Mr. W. Greaves, of Leeds, on "Improvements in the Manufacture of Concentrated Ammonia Liquor and Crude Benzol," introducing, as regards the latter, a method superseding the use of steam in the distillation of the absorbing oil.

Mr. Greaves said that with few exceptions before the war manufacturers of concentrated ammonia liquor were satisfied if they obtained a liquor averaging 16 to 18% NH_3. When the Government suddenly called for a solution with not less than 25% NH_3 and not more than 0·5% H_2S, lack of knowledge led to the putting down of comparatively elaborate, expensive but inefficient apparatus which had to be considerably altered before an equivalent in ammonia could be obtained to that yielded by the average sulphate plant. In reality the required apparatus for 25 per cent. liquor was exceedingly simple. All that was required was (1) an ammonia still and a lime still of such sizes that the former was able to deal with the ammonia waters sent to it without being overloaded, and the latter large enough to allow a sufficient contact of lime and liquor to bring the H_2S below 0·5 per cent. and eliminate as much as possible of the carbon dioxide and cyanides ; and (2) some form of still to expel as much H_2S as possible from the liquor sent to the first still, and a means of condensing the excess of steam contained in the ammonia vapours before final cooling. In both the design and working of the apparatus, however, there were pitfalls, which if not foreseen would lead to endless trouble and waste. He then proceeded to describe and illustrate an installation on the lines indicated above (adapted from an existing sulphate plant) from which 28 to 30 per cent. concentrated liquor is being regularly obtained, with an average H_2S-content of only 0·20 per cent. and an average of only 0·006 per cent. NH_3 in the waste water from the still. The tem-

peratures at the points of control were as follows :—Liquor going to the first reflux condenser, 15° C. ; liquor entering the desulphuriser, 71° C. ; vapours leaving top of desulphuriser, 77° C.

The author then gave details of a crude benzol plant which he said had been in successful operation for twenty months without break, and in which the product is obtained from the absorbing oil by furnace firing. The oil is pumped under pressure through a cast iron coil heated to 145° C. by hot furnace gases, and then sprayed into a small still or dephlegmator, of which the inside is at atmospheric pressure. The vapours pass away to a condenser and separator while the dehydrated and de-benzolised oil goes to coolers for re-use. In this simple way 65 per cent. crude benzol is easily obtained with a saving of approximately 4s. per ton of benzol (as compared with the cost of steam for distillation of the oil at 1s. 6d. per ton). The plant requires no housing, the capital cost is small, the apparatus durable, and the man in charge has to attend only to the fire, pump and thermometer.

In reply to questions, the author said that in the benzol plant there was no danger of fire in the event of the bursting of the cast iron coil, as it was surrounded only by the gaseous products of furnace combustion, and the pump supplying the coil would automatically shut down. On the other hand, the wash oil deteriorated somewhat rapidly, but they could use it until it got into a highly viscous condition.

SOCIETY OF GLASS TECHNOLOGY.

The February meeting was held in the University of Sheffield on February 20, in the presence of a large audience presided over by the President, Mr. F. Wood. A paper was read by Mr. H. H. Pitt, entitled "Some Notes on American Practice in the Glass Industry."

Mr. Pitt has a considerable knowledge of the working of English, Continental and American glass houses, and the subject matter of his paper dealt largely with information accumulated during a recent visit to the United States.

The American method of producing cut glassware in moulds was first described, and several articles were exhibited. The interior of each article is fine polished by jets of flame under pressure, the outside being kept cool either by leaving in the mould, or by removing and subjecting to an air blast. In all works in the States great care is exercised to keep presses and moulds in first-class condition, and much of the success achieved must be attributed to this. Neglect of presses and moulds in many English factories leads to dire results. In American glass works the men worked under ideal cooling conditions, and the comfort of the worker before the furnace was ensured by very large air-cooling devices. In some factories, systems of intermittent working are in vogue, the men having rest periods between spells of work. This is said to increase output and at the same time to render the work less irksome.

Detailed descriptions were given of various types of pressing and blowing machines. The Owens bottle-making machine received very full treatment, and the whole of the works practice from the mixing of the batch to the packing of the finished bottle was described in detail. The arrangement of a factory using the Westlake bulb-blowing machine was also fully described, and the fact was pointed out that this machine worked from a special pot into which metal was ladled from actual melting pots.

A description was also given of the various methods of making sheet glass by machinery.

NEWS AND NOTES.

AUSTRALIA.

A seam of black coal of excellent quality, three feet in thickness, has been discovered at Kilcunda, Victoria.

It is announced in the Press that a new seam of coal has been discovered at the Westralia Colliery near Collie. The seam has already been opened up to a width of nine and half feet and the coal is said to be the best for locomotive purposes yet found in the State.

In the pre-election policy speech of the Queensland Ministry, Mr. Ryan, the Premier, stated that he proposed to re-introduce a Bill authorising the establishment of State iron and steel works, and to proceed without delay with the development of State coal mines at Bowen and the Dawson Valley.

CANADA.

One of the smelting and mining companies which operates a smelter at Trail, British Columbia, produced, during 1917, 10,000 tons of pure zinc, valued at £600,000. The Company's refined lead production increased from 2000 to 22,000 tons.

A Toronto firm has undertaken to solve the problem of extracting potash from common Ontario felspar, on a commercially practical scale. The United States Government, it is stated, has placed orders with the firm for two tons of potash per day for the next two years.

An Eastern molybdenite company has secured an option on 200 acres in Connee township, three miles from Kakabeka Falls, and one and a half miles from a railway siding. The vein has been proved to a depth of 50 feet, and a cross-out shows it to be at least 16 feet wide. The ore will grade over 1 per cent., *i.e.*, about 20 lb. to the ton.

A newly discovered process—that of utilising flax straw, which is at present destroyed to the extent of thousands of tons a year in Western Canada—may solve the question of binder twine supply. This new process makes excellent samples of binder twine, cord and rope, which are said to be much stronger than the ordinary material and cheaper. In addition to the saving effected by the cheaper and better product, the western farmer will have the advantage of finding a market for a product which has hitherto been wasted.

The Canadian Department of Mines estimates the production of metals from Canadian ores in 1917 as follows :—Gold, 17,000,000 oz. ; silver, 23,500,000 oz. : copper, 113,000,000 lb. ; nickel, 84,800,000 lb. ; lead, 56,000,000 lb. ; zinc, 31,000,000 lb. The production of pig iron was about 1,186,000 tons and steel ingots and direct steel castings 1,735,000 tons. The production of coal was about 14,100,000 tons. The production of nickel, lead, zinc, pig iron and steel was greater than during the previous year. Higher prices received for silver, coal and other products considerably enhanced the total value of the mineral production, which is estimated to have been not less than forty millions sterling, compared with £35,440,306 in 1916.

SOUTH AFRICA.

Rope manufacture from local fibres has been carried on near Pietermaritzburg for some years past. Arrangements have recently been made for greatly extending this industry.

The factory erected at Merebank, near Durban, for the manufacture of alcohol motor fuel is now complete and operations will be started on the arrival of two French experts. The price of the fuel is expected to be about 2s. 9d. per gallon ; it would be much less but for the high cost of the particular denaturants insisted upon by the Government.

The Department of Agriculture has published the results of a long series of trials dealing with the effect of ammonium sulphate on South African soils. Except in the case of certain experiments in Natal, when this fertiliser was used very successfully together with potassium chloride and superphosphate on potatoes, the results were not good. The Department traces the general failure to two causes: the deficiency of lime in most South African soils, and that the application of nitrogen does not appear to be so essential as it is in other countries.—(*S. Afric. J. Ind., Dec.*, 1917.)

GENERAL.

Electro-metallurgical Developments in France.—Rapid strides are being made at some of the important French metal works in connection with the employment of electric plant. Although it is only about nine months since the first electric furnace was put up at the works of the Société Métallurgique de l'Ariège, two new furnaces have since been installed. In order to supply the necessary power for electric operation on an extended scale, steps are being taken to erect a new transmission line, which will link up the various works of this important company, and enable the best use to be made of the power available. It is intended to erect two new open hearth steel furnaces, each of 20 to 25 tons capacity, as well as a blooming mill, which will act as an intermediary between the steel works and the rolling mills. All this plant, which is to be electrically operated, is expected to be in operation before the end of the present year. Steps are being taken by the Pyrénées Hydro-Electric Company to tap fresh sources of power to serve the needs of local industries, some of which are engaged in the production of carbide of calcium.—(*J. Comm. Suppl., Feb.* 21, 1918.)

Oil from Grain Germs.—A representative of the German War Committee for Oils and Fats recently addressed a meeting of the agriculturists and mill-owners of the district of Solingen on the subject of the extraction of oil from the germ of grain. Although up to the present only 40 per cent. of the German mills have made the necessary arrangements for the work, 5,000,000 litres of oil have been obtained from this source in nine months. The germ contains 10—12 per cent. of oil, which it will be possible to utilise for the production of margarine. After the extraction of the oil, the residue of the germ yields a valuable albuminous food, which with the admixture of flour is utilised to produce rusks for the army, and has latterly been used also for the soldier's "morning drink." A still greater advantage resulting from the removal of the germ is the impossibility of the flour obtained from the grain becoming musty, since it is the fatty acids contained in the germ which cause decomposition. The flour is in no way inferior after the removal of the fatty substance; it bakes better, and the bread does not so easily turn mouldy.—(*Rheinisch Westfälische Zeit., Bd. of Trade J., Feb.* 21, 1918.)

Bauxite in British Guiana.—Bauxite occurs plentifully in British Guiana. After the conflicting interests of British and American prospectors had been smoothed down, the Demarara Bauxite Co. was registered, and in 1916 leases were entered into for a period of 99 years on about 3500 acres from the Government, in addition to freehold of 15,000 acres and mining rights on 6000 acres from private persons. The company started operations at the end of 1916 and is now shipping bauxite to Canada where, in terms of the leases from the Government, the aluminium is extracted. Rich deposits of bauxite occur in the north-western district of the colony and samples taken from Yarakita on the left bank of the Amakura river have on examination proved to be of exceptional value. It is intended to work these deposits on a large scale when title is obtained. In this vicinity there are also large deposits of magnetite of good quality. Regulations governing the mining of bauxite in this colony have not yet been made by the Government, but the terms and conditions of the leases of the Demarara Bauxite Co. are on record at the Colonial Office Library. In 1916 the Ministry of Munitions suggested that these bauxite deposits should be reserved for the benefit of the Empire, and in this connection account should be taken of the immense potential power supply provided by the Kaieteur Falls. A survey of the ore bearing area has been suggested, and further concessions are deferred.—(*Colon. J., Jan.* 1918.)

Sand and Gravel in the United States.—The output of sand and gravel in 1916 was "unprecedently large," and all kinds of sand increased in total value. This is noteworthy, in view of the shortage of labour and railway facilities, and shows how rapidly the owners of these materials have adapted themselves to new conditions by means of steam navvies and other mechanical arrangements for digging the sand, and by the use of motor lorries for transporting it.

The sand imported into the United States was less in 1916 than in the previous year, and much less than in 1914. The greater part of it was building sand brought as ballast from Canada, and about 400 tons of the rest was fine French (Fontenoy) sand used in casting bronzes. For the first time, the figures showing the value of sand exported to other countries are published, but the amounts are not stated. About 84 per cent. of the sand went to Canada—the amount so exported being rather more than double the value of that imported from Canada. About £1638 worth of refractory silica sand was sent to Panama for steel moulding; this is the second largest item on the list of exported sands.

Sands for glass-making were worked in 18 States, and as glass is being used in increasingly large quantities, the demand for these sands is growing rapidly. There is also a demand for glass coffins moulded in one piece. The average price of glass sand is $1 per ton, as compared with 10s. or more paid by English manufacturers. Moulding sands showed an increased output of 30 per cent. in 1916 over 1915, due mainly to munitions, and manufacturing and mining machinery. The greater part of these sands comes from Ohio and Pennsylvania. The war having practically stopped the importation of Fontenoy sand, the Geological Survey has found adequate substitutes at West Albany, N.Y., and at Zanesville, Ohio. The sharp, tough, hard sands used for grinding and polishing (including sand blasting) are chiefly obtained from Pennsylvania, about 40 per cent. more of which was used in 1916 than in 1915. Of fine sands (refractory silica sands used for lining and patching furnaces and ladles and for making runners for casting pig-iron), less was used in 1916 than in the previous year, but the total value was nearly double. Apparently other substitutes have been found or more durable linings have been used. Sand for paving and for filters has been used in larger amounts than before. Of building sand little is reported beyond an increased output of 4,272,036 tons, or 16 per cent. over that of 1915. The output of gravel fell from 37,972,548 to 32,477,927 tons, but its total value rose from $9,598,391 to $10,440,857.—(*U.S. Geol. Surv., Dec.* 21, 1917.)

Chromium in California.—Like manganese, chromium owes its present important position in the mineral industry to conditions arising from the

war. The chief use of chromite is as a refractory lining in steel or copper furnaces, and smaller amounts are used in the manufacture of chrome-steel alloys. In California, chromium occurs in association with serpentine as the black oxide, chromite, and is found in both the coast range and the Sierra Nevada. Previous to 1916, California was the only State where chromium ore was worked on a commercial scale. Large amounts of low grade chromite were necessarily mined along with the more valuable ore, and until recently this material was piled on the dumps. An effort is now being made to concentrate this low grade ore. One plant for this purpose was tested in October last and another was recently completed. A trial run on 10 per cent. ore yielded a 40 per cent. concentrate and left 10 per cent. of chromic oxide in the tailings. There are between 70 and 80 chromium ore mines in California.—(*U.S. Iron Trade Review, Jan.* 31, 1918.)

Saccharine and Glucose in Human Diet.—At the present time saccharine and its soluble sodium salt are being used extensively as sugar substitutes, and however much they may fall short of the natural foods as regards flavour, no symptoms have been described as arising from their use. Quite recently some doubts have been raised by a paragraph which appeared in the Press to the effect that saccharine is liable to interfere with the digestion, especially in susceptible individuals. This seems to have been inferred from general principles rather than from the occurrence of actual cases of digestive disturbances, and it is quite contrary to a very wide experience of the use of saccharine in cases of diabetes and other conditions. It may be said at once that saccharine has been in use to sweeten food for a quarter of a century and that no case is known in which any deleterious symptoms arose from quantities sufficient to give even a very sweet flavour to the food. As much as 5 grammes have been taken at one dose without any symptoms resulting. This is equivalent in sweetening effect to nearly three pounds of sugar. Careful experiments on the digestive ferments in the test-tube have failed to show any effect from the addition of saccharine in much larger quantities than any one would care to take in food, and the same negative result has been obtained as regards the digestion and assimilation of food sweetened with saccharine in experiments on living animals and men. The apprehension that saccharine and its salts may interfere with digestion appears to have no foundation.

As regards glucose, the matter stands on a different footing, for no one would suggest that this sugar is harmful in itself, since it is a constant constituent of the tissues. But glucose is formed by the use of acids and the acid generally employed is sulphuric, which sometimes contains arsenic; this poison may thus become an impurity of the glucose. That this danger is a real one was shown in the Manchester epidemic of arsenic poisoning, about 20 years ago, when the arsenic was found in beer made from glucose. And that the danger is not altogether eliminated is further shown by a recent report of the Local Government Board, in which arsenic is stated to have been found in baking powder substitutes containing acid phosphate obtained by the use of sulphuric acid. The possible contamination of glucose with arsenic seems to deserve continued attention. The danger would vanish if sulphuric acid were forbidden in the manufacture of glucose for human consumption. Other acids, notably hydrochloric, are equally efficient in the hydrolysis of starch, and are not likely to contain arsenic.—A. R. C.

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

Indian Chrome Ore.

In the House of Lords on February 26, Lord Sydenham asked whether the firm of Ettlinger and Co., which was precluded from trading in India in 1916, had obtained through the medium of the Baluchistan Mining Co. a monopoly of the supply of Indian chrome ore for Europe, excluding the United Kingdom; whether this firm was permitted to hold a large consignment of chrome ore at Calcutta; and whether this firm of naturalised Germans, having obtained a decree severing its connection with Beer, Sondheimer, and Co., of Frankfort, in October last, was now free to trade as a British firm.

Lord Hylton, in reply, said this particular company belonged to two individuals, both of German origin and both naturalised British subjects, one being naturalised in December, 1888, and the other in July, 1903. They carried on business for some years at Finsbury Court, London, as merchants, and had branches in Bombay and other places in India. After the passing of the Trading with the Enemy Act, the business of this firm was investigated by the Board of Trade, but nothing was disclosed which would give the Board of Trade power either at that time or any time since to wind up the business on the ground that it was carried on partly or mainly for the benefit of enemy subjects. It was a fact that before the war this firm had intimate relations with the Frankfort firm of Beer, Sondheimer, and Co. with regard to minerals connected with the iron industry. But this agreement was terminated *ipso facto* by the outbreak of war. In regard to Lord Sydenham's first and second questions, the answer was in the negative. As to the third question, the agreement with the Frankfort firm was terminated on the outbreak of war, and a declaration to that effect was made by the High Court.

HOUSE OF COMMONS.

Home Supplies of Fuel Oil and Metals.

In the debate on the Vote on Account (Civil Services and Revenue Departments Estimates, 1918-19) on February 27, Capt. Barnett urged on the Government the importance of utilising cannel coal, blackband ironstone, and lignite for the production of fuel oil (see p. 93 R). In his reply, the Financial Secretary to the Ministry of Munitions (Sir Worthington Evans) said that during the past few months the supplies of fuel oil from home sources had been doubled. His Department had entertained the proposal of erecting batteries of retorts on some mines, and some retorts had actually been installed, but acting on advice it was decided to promote the production in a more expeditious and economical manner by setting up plant at various gasworks for the treatment of cannel coal by a process which was not truly a low-temperature distillation. During the next few months several of these plants would be in operation and, subject to the limitations of materials and labour, there was no reason why all the cannel coal raised should not be treated at existing gasworks.

In reply to Mr. Field, Sir W. Evans stated that experts of his Department had searched for lead and copper in a dozen directions, and that in one centre a copper proposition had been found which promised well, and which might prove to be a "real big thing."

Regarding the question of iron ore, the Cleveland output was increased by over half a million tons between 1916 and 1917, and as a result of a survey made early in 1917, it was quite clear that the increase could be raised to two million tons. Preparations had been made for substituting home ore for imported ore in case of necessity. The limiting factor of the supply of steel was the shortage of basic furnaces. There had been an increase of about 19 per cent. in the production of basic steel during the past eight months, and this would be further augmented by another 10 or 11 per cent. within the next half year.

Linseed Oil.

Mr. Denham asked the Minister of Munitions whether supplies of linseed oil required for the production of glycerine and soap are being used with his approval in the production of linoleum.

Mr. Wardle: The War Cabinet has decided that, in order that Government requirements may be met, and to obviate unemployment in certain localities, manufacturers of linoleum shall be allowed to use certain stocks of linseed oil actually in their hands. I understand that certain processes now under investigation may enable manufacturers to dispense with the use of linseed oil at an early date.—(Feb 21.)

In answer to Sir H. Nield, Mr. Clynes said that the necessity for granting supplies of linseed oil for veterinary purposes has not been overlooked. Arrangements have now been completed by which a person requiring linseed oil for veterinary purposes shall apply to the Linseed Oil Consumers' Association which, on receipt of a form duly filled in by the applicant, will immediately grant him a priority certificate. Priority certificates from the Ministry of Munitions are not required except in the case of lots over two tons in weight, which are, as a rule, not involved in this sort of allocation.—(Feb. 28.)

Sir J. D. Rees asked whether sufficient stocks exist of linseed oil for use in foodstuffs and in making soap; and whether the latter industry has first claim after the first requirement. In reply Mr. Parker said: The limited stocks of linseed oil in the U.K. are allocated—first, to foodstuffs; secondly, to the soap and candle manufacturers, who split the oil and pass on the glycerin obtained from it to munitions factories. The residual fatty acids are allocated on the following system of priority:—(1) Soap and candle trades; (2) paint and varnish; (3) linoleum and kindred trades.—(March 4.)

Tungsten Ore.

In answer to General Croft, Mr. Wardle said that so far as he was aware no tungsten ore had been exported from this country to Germany *via* neutral markets since the outbreak of war.—(Feb. 25.)

Saccharine.

Sir J. D. Rees asked the President of the Board of Trade whether, since the use of saccharine, saxine, and the like preparations has now increased to a hitherto unprecedented degree, and is likely further to increase, the Government will obtain and make public the considered opinion of its advisers in the Department of Public Health as to their harmless or harmful character.

Mr. Clynes: I have been asked to reply. I am advised that there is no foundation for the suggestion that the use of saccharine as a sweetening substance is likely to prove injurious to health. The investigations made in 1911 for the United States Department of Agriculture have established the harmlessness of saccharine when taken in ordinary quantities. Doses up to 5 grains daily, *i.e.*, fifteen times the strength of the usual tabloid, were found during long periods to cause no disturbance whatever of digestion or detriment to health in normal adults. A recent report of the Royal Society stated, however, that evidence is lacking as to whether saccharine is equally harmless to children, also that it is in no sense a food, but merely a flavouring agent. The conclusion would seem to be that sugar should be given to children, while saccharine may be quite safely taken in moderate quantities by healthy adults in tea, coffee, and mineral waters.—(Feb. 28.)

Resin Exports.

Lord R. Cecil stated in a reply to General Croft that the total imports of resin into Sweden for 1913 were 6772 tons, and for 1915 6382 tons. Of this, there came from Great Britain in 1913 19 tons, and in 1915 1432 tons, and from Germany in 1913 5943 tons, and in 1915 81 tons.—(March 5.)

LEGAL INTELLIGENCE.

Railway Charges for Benzol, Toluol and Naphtha. *Traders' Traffic Conference (Walsall)* v. *Midland Railway Company.*

The Railway and Canal Commissioners (Mr. Justice Lush, the Hon. Gathorne Hardy and Lord Torrington) had before them on February 19 an application by the Traders to vary the order given by the Court in December last, to the effect that benzol, toluol, etc., could not be classed as "spirits of tar" under Class 2, and that the Railway Company was justified in classifying them as dangerous goods under Class 3 (this J., 1918, 16 R).

Mr. B. Ward appeared for the applicants, and claimed that the materials in question should only be placed in Class 3 if their flash-point was below 73°.

Mr. E. Hill opposed the application for the Railway Company, and submitted that the effect of the variation asked for would be that when solvent naphtha had a flash-point above 73°, it could be transported as spirits of tar; he wanted it to be made clear that "spirits of tar" could not apply to a coal tar-product with a flash-point below 73°.

Mr. Justice Lush suggested that the order should run, "This Court doth declare that benzol, naphtha and toluol are not spirits of tar within the meaning of those words in Class 2; and this Court doth further declare that benzol and naphtha with a flash-point below 73°, and toluol, are dangerous goods." The Court had previously decided that naphtha of *any* flash-point was not "spirits of tar." Counsel agreed to the order being amended as suggested by the Court.

Arbitration: Construction of Agreement. *The Anglo-Continental American Co., Ltd.*, v. *The Saccharin Corporation, Ltd.*

Judgment was given in this case (see J., 1918, 78 R) on February 26, by Mr. Justice Sankey, who said that he held on the true construction of the agreement that the Corporation had not got to bring into the account, as between it and the Anglo-Continental Chemical Co., the amount of the profit made by the Syndicate. The reason he so held was this: he thought the Corporation and the other members of the Syndicate were a partnership, and that the Corporation did not, under the main agreement, contract to give the Company 5/24 of that partnership. What it contracted to give was 5/24 of the annual net profits secured out of the sale of saccharin in the United Kingdom; and in his opinion these annual profits were not the profits of the trading by the Syndicate. His lordship said he thought the Company was entitled to examine any necessary accounts, as provided

in the agreement, and he referred the matter back to the arbitrator to deal with it on the basis he had indicated, the appellants' accountant to have all reasonable information, and the 5 per cent. interest on the capital was to be brought into the account.

The Saccharin Corporation was awarded costs.

German Patents for Dyes.—On February 28, the Comptroller of Patents granted to British Dyes, Ltd., licenses to use twelve patents standing in the name of the Badische Soda und Anilin Fabrik for the manufacture of dyes, mainly of the anthraquinone series, The patents were all of recent issue, from 1906—1914; some of the colors were azo dyes and lakes, and No. 9122 of 1911 was for coloring matter containing sulphur. British Dyes, Ltd., offered a royalty of 2½ per cent., as before, and 1 per cent. for intermediates. This company has now acquired the right to use 127 German patents relating to dyes.

GOVERNMENT ORDERS AND NOTICES.

PROHIBITED EXPORTS.

Orders of Council, dated February 8 and 26, prohibit the exportation from the United Kingdom of certain materials as follows:—

Feb. 8. (1) *That the following headings should be deleted**—

(A) Soda, caustic. (B) Tin, chlorides of. (C) Tin, compounds of (except chlorides and oxide of tin). (B) Tin, oxide of and mixtures and preparations containing tin oxide. (A) Coir. (A) New Zealand flax. (C) Vegetable fibres. (B) Gum tragacanth. (B) Tissues and fabrics of silk of all kinds including artificial silk). (B) Tin, and alloys of tin, not otherwise specifically prohibited. (C) Tin, manufactures of (except hollow-ware, tin plates, and receptacles made from tin plates). (B) Tin ore.

(2) *That the following headings should be added*:—

(A) Ambergris. (A) Soda, caustic, and mixtures containing caustic soda. (A) Tin, chlorides of. (B) Tin, compounds of except chlorides and oxide of tin). (A) Tin, oxide of, and mixtures and preparations containing tin oxide. (A) Fibres, vegetable, not otherwise specifically prohibited. (C) Fibres, vegetable: Tissues and manufactures thereof, not otherwise specifically prohibited. (A) Gum tragacanth. (B) Tissues and fabrics of silk of all kinds (including artificial silk). (A) Tin and alloys of tin. (B) Tin, manufactures of (except hollow-ware, tin plates, and receptacles made from tin plates). (A) Tin ore.

Feb. 26. (1) *That the following headings should be deleted*—

(A) Asphalt. (B) Bitumen, liquid or solid. (A) Ammonium nitrate, perchlorate, sulphate and sulphocyanide. (A) Fireclay, and articles manufactured of fireclay, including firebricks. (C) Pitch, and all mixtures, preparations, and commodities of which pitch forms an ingredient. (A) Soap containing more than 1 per cent. of glycerine. (C) Soap (except soft soap) containing 1 per cent. or less of glycerine. (B) Soap, soft, containing 1 per cent. or less of glycerine.

(2) *That the following headings should be added*:—

(A) Asphalt, and articles containing asphalt. (A) Bitumen, liquid or solid, and articles containing bitumen. (A) Ammonium nitrate and mixtures containing ammonium nitrate. (A) Ammonium perchlorate and mixtures containing ammonium perchlorate. (A) Ammonium sulphate and sulphocyanide. (A) Fireclay, and articles wholly manufactured of fireclay, including firebricks. (C) Pitch, and all mixtures, preparations and commodities of which pitch forms an ingredient, not otherwise specifically prohibited. (A) Soap, including soft soap.

* The prohibition of exports is as follows:—
Goods marked (A), to all destinations.
Goods marked (B), to all ports and destinations abroad other than ports and destinations in British Possessions and Protectorates.
Goods marked (C), to all destinations in foreign countries in Europe and on the Mediterranean and Black Seas, other than France and French Possessions, Russia, Italy and Italian Possessions, Spain and Portugal, and to all ports in any such foreign countries, and to all Russian Baltic ports.

The Director of the War Trade Department announces that after consultation with the United States and Allied Governments it has been decided to resume the issue of licences in approved cases for the export to Sweden and Holland of the following materials:—

China, glassware and earthenware. Acetyl salicylic acid. Amidol and substitutes. Ammoniac compounds. Arsenobillon. Bromine. Camomile. Digitalis. Eucaine. Ferric compounds. Hydrobromic acid. Kharsevan. Metol. Nitrate of Silver. Novocain. Opium, alkaloids of. Salicylic acid. Salvarsan. Sodium bromide. Films. Flower seeds, except seeds of oil-bearing plants. Gauge glasses.

IMPORTS FROM THE UNITED STATES.

The United States Government has decided that no export licences will hereafter be granted for any goods to be exported to the Allies, whether purchased by Governments or by private traders, unless sanction for the purchase and export has been obtained from the American Purchasing Commission. Such sanction will not be given in respect of any consignments which are not recommended by the competent Authority of the Allied Government concerned, but it should not be assumed that the sanction will follow the recommendation as a matter of course. Sanction to purchase will not, however, be required for goods (a) which are in stock in the United States already manufactured; and (b) of which the manufacture in accordance with British specifications has already begun.

The Competent Authority of His Majesty's Government respecting all goods to be purchased by private traders in the United States is the Department of Import Restrictions, Board of Trade, 22, Carlisle Place, London, S.W.1.

It is therefore notified to all importers from the United States and to all others whom it may concern that prior to the placing of any order for goods from the United States permission to do so must be sought from the Department of Import Restrictions, who will examine the request, and if of opinion that, having regard to all the circumstances of the situation existing at the time, the import of the goods can properly be sanctioned, will hand to the applicant a numbered permit. The number must be communicated by the importer to the exporter in the United States with whom he desires to place the order, and the exporter will approach his authorities for their sanction.

It should be understood that the permit must be obtained for all classes of goods whether on the Prohibited Import List or not. In respect of those goods which are on the prohibited list the issue of a permit may be regarded as connoting an undertaking to issue an import licence when the goods arrive in the United Kingdom.

LEAD CONTROL AMENDMENT ORDER, 1918.

The Minister of Munitions has fixed (Feb. 19) additional maximum prices as follows:—

Used type metal.—(a) Type in case, including standing matter in chase and paper, on boards and matter awaiting distribution, £43 per ton. (b)

Spacing material, including quads, quotations, metal furniture and leads, £29 per ton. (c) Electro-plates and blocks, £30 per ton. (d) Stereo-plates, metal and blocks, £36 per ton. (e) Linotype metal, £32 per ton. (f) Monotype metal, £36 per ton.

The above prices include cost of packages and delivery f.o.r.

[NOTE.—Nothing contained in the above Order will relieve the purchaser or seller of any type metal from the necessity of obtaining and observing the terms of the licences required under the above-mentioned Order of 1st September, 1917.]

PAPER RESTRICTION ORDER, 1918.

The Board of Trade has issued a new Order (Feb. 27) to the following effect:—(1) Importers and manufacturers of, and dealers in, wrapping and packing paper, strawboard, millboard, wood pulp board, cardboard, pasteboard boxes and cartons made of paper, shall during the year Feb. 28, 1918—Feb. 28, 1919, not supply to customers more than two-thirds of the weight of such materials supplied during the previous 12 months. (2) For other kinds of paper, etc., the maximum weight is to be one half of that previously supplied. (3) Paper ordered but not supplied in the previous year is to be excluded in calculating the new amount. (4) Buyers shall give to their manufacturer or dealer notice of their requirements during each four-monthly period ending June 30 and October 30, 1918, and February 28, 1919. (5) Disputes between buyers and sellers shall, in default of agreement, be decided by the Royal Commission on Paper. (6) After holders of priority certificates have been supplied, balances of stock to be distributed *pro rata* among purchasers not holding certificates. (7) The Royal Commission may excuse the fulfilment of any requirements made under (1) and (2), if fulfilment be impossible or unreasonable. [For full text, see *London Gazette*, March 1. The Regulations issued by the Commission are in the *Board of Trade J.*, March 7.]

OTHER ORDERS.

Re-scutched Tow Order, Feb. 28, 1918.

Flax (Restriction of Consumption) No. 3 Order. Feb. 26, 1918.

Wool (Off-Sorts) No. 2 Order. Mar. 1, 1918.

Export of Hides (Ireland) Order Amendment. Mar. 2, 1918.

THE NON-FERROUS METAL INDUSTRY.

The President of the Board of Trade has appointed Sir D. S. Smith (Chairman), Sir H. Elverston, M.P., and Mr. H. J. Mackinder, M.P., to be a Committee to examine all applications for licences under the Non-Ferrous Metal Industry Act, 1918, and to report to the Board of Trade thereon.

The Rules made by the Board of Trade under the Act are given in the *Bd. of Trade J.*, Mar. 6, and in the *London Gazette*, Mar. 7.

TIN AND TUNGSTEN RESEARCH.

The Committee of the Privy Council for Scientific and Industrial Research has appointed the following research board to deal with the recovery of tin and tungsten from their ores:—Sir Lionel Phillips, Bt. (Chairman); Mr. J. G. Gilbert, Sir Frank Heath, Sir T. K. Rose, Mr. E. Taylor, Mr. R. A. Thomas, Sir R. Threlfall, with Mr. A. Richardson as Secretary (15, Great George Street, Westminster, S.W.1).

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, Feb. 21 and 28, 1918.)

OPENINGS FOR BRITISH TRADE.

Application has been received at the Department of Overseas Trade (Development and Intelligence) for the names of firms holding stocks of zirconia.

The Director-General of Commercial Intelligence at Calcutta reports that an agent in Bombay desires to get into touch with U.K. manufacturers and exporters of metals and manufactured metal goods, chemicals, paper, etc., etc. (Ref. No. 34.)

A Canadian company manufacturing casein has forwarded to the office of the Canadian Government Trade Commissioner, Portland House, Basinghall Street, E.C.2, a set of samples of casein, which is at the disposal of U.K. firms interested in obtaining supplies.

A firm of manufacturers' agents in Madrid desires to obtain agencies in Spain for U.K. manufacturers of chemicals. (Ref. No. 41.)

TARIFF CUSTOMS EXCISE.

Australia. A Proclamation dated November 14, 1917, prohibits the exportation of margarine containing any oil or other matter not necessary to the manufacture of margarine, and which causes the colour of the finished product to resemble butter, and also the export of margarine containing fat obtained from diseased stock, or containing fat refined in other than open steam-jacketed kettles or pots. The Proclamation issued on June 24, 1914, is revoked.

Brazil. Import duties are now levied on a number of chemical compounds, including: acids and compounds used for making dyes (1500 reis per kilo.), acetic acid and certain metallic acetates, chromium and aluminium sulphates, acetone, creosote oil, formaldehyde, and compound ultramarine blue. Fuel oil and certain medicines are duty free.

British Guiana. The only changes made in the tariff which was operative during 1917 occur in the Schedule of Specific Import Duties. These amended duties relate to grease, petroleum (including residual oils), and distilled oil fuel (including gas oil and intermediate oils); otherwise the tariffs for 1917 will remain unchanged during 1918. The following are free of import duty: chemicals for use in the manufacture of matches, manures, vermin killers, and insecticides, including sulphate of ammonia, nitrate of soda, lime, Paris green, arsenite of soda, and other substances which the Comptroller of Customs is satisfied are imported for use as manure or as remedies for diseases of plants or preventives of attacks by rats or other vermin or by insects on plants and animals.

East Africa Protectorate. The *Official Gazette* of January 4, 1918, contains copy of a Proclamation (No. 2 of 1918) prohibiting the importation into the Protectorate of the following goods:—Cloves, copra, ground-nuts, and sim-sim.

Fiji. Export duties of 10s. per ton on copra and 10s. per ton on sugar are now in force.

French Colonies. Exportation of sodium fluoride from French Colonies and Protectorates (other than Tunis and Morocco) is prohibited to destinations other than French.

The exportation of sugar from French Possessions (other than Tunis and Morocco) to France and French Possessions is prohibited.

Sweden. Exportation of pyrites ash (purple ore) containing copper has been prohibited as from February 9.

REPORT.

Report of the Departmental Committee on Cylinders for Dissolved Acetylene. 1918. *2s. net.*

Acetylene differs from other gas in ordinary commercial use in that even without oxygen it is explosive at as low a pressure as 2 atmospheres. It was therefore forbidden by law in 1897 to compress acetylene beyond a limit of 100 inches of water (about 4 lb. per sq. in.); at a later date this figure was increased to 250 inches.

It was soon discovered however that the gas could be safely compressed into certain porous materials, and in 1901 the legal pressure limit under these conditions was fixed at 150 lb. per sq. inch. The property possessed by acetone of dissolving acetylene was next utilised to increase the capacity of a cylinder of given size. At atmospheric pressure 1 volume of acetone dissolves 25 volumes of acetylene, and this solubility increases proportionately with the pressure so that at 150 lb. per sq. inch the solvent dissolves 250 times its own volume. It thus became the practice in the trade to fill a cylinder with porous material (of porosity about 80 %), then to add a volume of acetone equal to 40 % of the original cylinder volume, and pump in the acetylene to a pressure of 150 lb. per sq. inch. A simple calculation shows that at this pressure a cylinder of 1 cub. ft. capacity containing 0·4 cub. ft. of acetone will hold 100 cub. ft. of gas.

Acetone is the best solvent, but under war conditions it has been necessary to introduce substitutes, two of which have been used successfully. These both contain a large proportion of acetone (up to 40 %) and are in fact first runnings from acetone distillations.

The use of substitutes is attended by some difficulties apart from their lower solvent power. They possess different specific gravities from acetone. A certain amount of solvent has to be added to the cylinders from time to time to make up the loss. This addition is usually made by weight and in making up a substitute filled cylinder with acetone, there is a possibility of over-charging with solvent and so diminishing the free space to dangerous dimensions.

As regards the porous materials, there are only three in general use :—(1) A mixture of asbestos kieselguhr and charcoal with a suitable cement, (2) charcoal alone, and (3) kapok. The packing must be done with care to prevent the material shaking down and leaving cavities or pockets.

Such were the general conditions prevailing in the dissolved acetylene trade when in 1916 several serious accidents occurred, and the Committee was appointed to investigate the whole matter.

Representatives of the leading firms were consulted, works were visited, experiments were carried out at the Home Office Experimental Station, Eskmeals, and a number of cylinders were tested at the National Physical Laboratory. A full summary of the Committee's recommendations is given below in the Committee's own words. The chief finding was that all the accidents had occurred with defective cylinders having acetylene-welded joints. The whole process and methods of compressing acetylene into acetone contained in a porous material were fundamentally sound and it was proposed to increase the pressure limit to 225 lb. per sq. inch (the Continental standard), provided suitable solid drawn cylinders were used.

Summary of Recommendations.

1. That a sample of every porous material allowed to be used should be deposited at the Home Office, and that no new material should be used unless a sample has been previously deposited. That the porosity should not exceed 80 per cent.

2. (A) That substitutes for acetone should be allowed.

(B) That mixtures of different solvents should not be permitted, at any rate after the conclusion of hostilities.

(C) That any Order should make it clear that the solvent must not completely fill the porosity of the porous substance under any rise of temperature likely to be met with in ordinary practice.

3. That the pressure may be raised to 225 lb. per square inch for all solid drawn cylinders and only for such acetylene welded cylinders above 100 cub. ft. capacity as are so constructed at top and bottom that the strength at these joints is not dependent entirely upon the welds, but this concession to acetylene welded cylinders should apply for a limited period only.

The increased pressure should not be allowed in cylinders containing porous substance only without solvent. The pressure allowed should be stated to be at 60° F.

4. (A) That cylinders should be made of mild steel of high ductility of which the carbon content does not exceed 0·25 per cent. and the phosphorus and sulphur each not more than 0·05 per cent.

(B) That the test pressure should be four times the working pressure, and should be maintained for not less than 15 minutes.

(C) That as soon as conditions of manufacture allow, the process of welding the joints of acetylene cylinders by the oxy-acetylene process should be discontinued. In the meantime that spinning over the ends constitutes a sufficient safeguard, and should be carried out with welded cylinders of 100 cub. ft. capacity and upwards. Sufficient time to be given for the gradual replacement of cylinders at present in use after the manufacture of solid drawn cylinders has commenced, but all welded cylinders should eventually be withdrawn from service.

(D) That all cylinders should be annealed.

(E) That the use of safety plugs should not be required in future.

5. That re-testing of acetylene cylinders may be confined to a thorough visual examination, carried out at intervals, and the results of such examination entered in the history sheet of the cylinderers.

6 and 8. That filling stations should be approved by and be subject to inspection by the Home Office, and that regulations be made with regard to imported cylinders requiring a certificate from the importer that the cylinders comply in all respects with regulations imposed upon home filled cylinders.

7. That where one company undertakes to recharge the cylinders manufactured by another company they should first obtain any necessary information both as regards porous material and solvent.

9. That certain marking on cylinders should be compulsory, and that records should be kept. [These recommendations are set out in detail in the body of the report under the heading "9. The Marking of Cylinders."]

10. That the charging of acetylene cylinders by the application of low temperature should be allowed, and, if deemed to be prohibited by the existing Order in Council, this Order should be amended.

11. That any use of acetylene cylinders except that for which they are designed should be prohibited.

A. R. R.

Corrigendum.

Report, Mines and Quarries, p. 62 R, the amount of coal used in the production of pig iron in 1915 should read 2,509,456 tons, and that of coke used in 1916, 10,390,888 tons.

TRADE NOTES.

BRITISH.

"*The British Chemical Trades Association.*"—At a meeting held in London on March 6, it was decided to form a new body under the above title with the objects of (a) protecting and promoting the interests of the chemical trades, (b) regularising contracts, and (c) arranging and maintaining a regular and ordered system of arbitration. The Provisional Committee elected consists of: Mr. W. Mann (Chairman), Mr. N. L. Lederer (Hon. Treas.), Mr. S. J. C. Mason (Hon. Sec., The Fabra Co., Ltd., 24, Minories, E.1.), and Messrs. A. Arnold, W. Castle, I. A. Keene, H. Slater, F. W. Powell, R. J. D. Roff, and D. J. Truscott.

Growth of Canada's Exports.—The unrevised statement of Canadian trade for the past year shows that Canada has made pronounced gains in the export of chemicals, expolsives, etc. The following are the values (dollars):—

Exports from Canada.	1916.	1917.
	$	$
Drugs, dyes, chemicals	1,222,592	1,823,250
Electric apparatus	573,044	1,357,824
Munitions	73,904,586	240,302,414
Explosives	7,080,926	40,917,856
Gasoline engines	85,641	133,673
Machinery	1,522,579	2,260,714
Pig iron	307,721	343,906
Wire and wire nails	4,483,263	9,038,143
Total iron and steel and manufacturing of	54,483,597	49,065,299
Plumbago, manufactures of	141,348	352,906
Paints and varnishes	349,298	962,988
Paper	20,039,550	26,123,215
Sugar, etc.	313,684	3,931,933
Wood pulp	10,376,548	20,404,053
Manufactures of wood	11,497,870	21,378,798

—(*Can. Chem. J.*, *Feb.*, 1918.)

FOREIGN.

Brazil.—The total trade for the year 1916 was valued at £96,000,000, an increase of nearly 15 per cent. on the previous year. The U.S.A. is now the principal purveyor to Brazil, supplying 40 per cent. of the entire imports. Before the war, Germany was the principal supplier of chemicals, and with this supply cut off the American trade in these articles has greatly developed. The chemicals in demand are very varied, the heavier chemicals being used in the local industries (soap, candles, beer, perfumery, etc.). The U.S.A. was also the chief consumer of Brazilian goods, taking 47 per cent. of the total. Included in the exports were cacao (43,720 tons), carnauba wax (4167 tons), and hides (45,552 tons). Manganese ore reached the record amount of 503,130 tons, all but ten tons going to the U.S.A.

In the following table, the sources of supply of the chief chemicals imported are analysed:—

Pyrites from Cuba.—The Davison Chemical Co., manufacturing sulphuric acid at Baltimore, is arranging for regular shipments of pyrites from Cuba, to replace supplies hitherto obtained from Spain.—(*Jan.* 14.)

State Purchase of Chilian Nitrate.—The U.S. Government has purchased 100,000 tons of nitrate, of which 18,000 are to be delivered in January. The nitrate will be sold to farmers at $75.50 per ton f.o.b.—(*Jan.* 21.)

Dye Manufacture in Brazil.—According to the *Agencia Americana*, the production of dyes includ ng indigo in Brazil has greatly developed recently. The number of factories has trebled and the companies have doubled their capital and staffs in order to meet important orders from the River Plate and Europe, and the demand for raw material from the U.S.A. The majority of the dyes in question are manufactured from Brazilian wood. It is understood that a German trust, with a capital of 275 million mk., intends to gain control of the Brazilian market after the war; and to defeat this object a protective tariff against German goods will be imposed.—(*Jan.* 14.)

"*The Dyestuffs Association of America.*"—At a convention held recently in New York, it was decided to form this new national association for furthering the interests of the American dye industry. The proceedings of the convention, which lasted two days, were presided over by Mr. Frank Hemingway, who urged the need for an organisation which would benefit the industry as a whole and protect the interests of both large and small manufacturers and merchants. Considerable discussion took place on the question of eligibility for membership, but finally it was agreed that only American manufacturers having plants in America and owned by American interests could be admitted to full membership; dealers and manufacturers of allied products could become associate members without the right to vote.—(*Jan.* 28.) [*Oil, Paint, and Drug. Rep.*]

Portugal.—The year 1916 was a prosperous one for Portugal, the total trade at the port of Lisbon (119,636,000 escudos), showing an increase of 48 per cent. The principal articles exported included copper ore, corkwood, wine, vinegar, and olive oil. The wine industry has been exceptionally prosperous, 144,410,280 gallons being produced, an increase of 60 per cent. A shortage of tinplate for the sardine industry is noted, but more serious has been the lack of coal; Cardiff coal was selling in February, 1917, at 150s., and railways, factories and lighting establishments were compelled to use wood. The increased trade has benefited the U.S.A. in particular, American drugs and chemicals being imported in unusual quantities. Encouraged by the shortage of coal, an anthracite mine near Oporto has been actively developed. (1 escudo (gold) = 5s. $4\frac{1}{4}$d.)—(*U.S. Com. Rep.*, *Dec.* 31, 1917.)

Article.	Total value.	U.S.A.	U.K.	France.	Other Countries.
	£	%	%	%	%
Calcium carbide	17,500	90	—	—	4·6 (Norway)
Calcium chloride	37,000	41·5	58·5	—	
Caustic potash	600	100	—	—	
Caustic soda	320,000	70	30	—	
Chemical fertilisers	574	27	10	—	
Chemical products and medicines	1,300,000	40	25·6	24·6	
Scientific instruments	20,800	48·5	19·6	20	
Cement	900,000	24	37·7	—	23·8 (Denmark)
Aniline dyes	23,800	63	nil	—	22·6 (Switzerland)
Paints (dry)	56,500	39	57	—	
Paints (prepared)	110,000	36	60	—	
Perfumery	180,000	14	6	77·5	
Soap (unscented)	29,600	31	58	—	
White lead	7,000	45	52·5	—	
Zinc oxide	131 000	5·8	42·5	—	33 (Belgium)

—(*U.S. Com. Rep.*, *Dec.* 28, 1917.)

PERSONALIA.

Dr. E. L. Peck, General Works Manager at Messrs. Lever Bros., has been appointed Deputy Director of the Company.

Mr. E. Kilburn Scott has been appointed Consulting Engineer to the British American Nitrates Company of New York.

Mr. W. J. Uglow Woolcock, Assistant Director of Army Contracts, has been appointed to the post of General Manager of the Association of British Chemical Manufacturers, 166, Piccadilly, W.1. It is understood that Mr. Woolcock will take up his duties with the Association when the Department concerned is in a position to release him.

COMPANY NEWS.

BRUNNER, MOND & CO., LTD.

A special meeting of shareholders was held at Liverpool on February 20 to confirm the resolutions passed at the extraordinary general meeting held on February 5 (J., 1918, 63 R). In the course of his remarks the Chairman said that it would be against the interests of the shareholders to disclose the details of the company's valuation, but it had been very carefully considered by the committee and the board of directors, both of which had passed it unanimously as correct. The resolutions were confirmed.

SOUTH STAFFORDSHIRE MOND GAS COMPANY.

The seventeenth annual meeting of the shareholders was held on February 26, at Dudley Park.

Mr. R. L. Mond (deputy chairman) in submitting the Directors' Report stated that the adverse conditions under which they were working in 1916 became steadily worse during last year; but the Act of Parliament permitting them to fix a new scale of charges for gas received the Royal Assent last May and prices were advanced from July 1. During the months in which they were able to establish harmony between the selling price and cost of production they had realised a profit which was not unsatisfactory. But the continual rise in price of both labour and raw materials—and especially the fact that the selling price of sulphate of ammonia was fixed two years ago on a basis which had taken no account of that rise—tended automatically to make them late in adjusting the price of gas. The Government was pressing all gas undertakings to produce 25 per cent. more ammonia.

The negotiations with the Ministry of Munitions for putting down another unit of plant had been subjected to many delays. Last summer the Ministry stipulated that before an advance could be made, the Company must obtain a special Act of Parliament to enable it to give the Ministry a prior charge on the undertaking for any money lent This Act was passed in December last, and the financial arrangements were practically completed; but now, owing to the very exceptional conditions prevailing, the authorities were unable to allow them to start the work. They were extremely disappointed, and the Board was now making every endeavour to obtain the permission for the scheme to be carried out. The consequence of their difficulties was that the gross profit was £729 less than last year. A dividend on the 6 per cent. cumulative preference shares was recommended and passed.

JOHN KNIGHT, LTD.

At the annual general meeting, held on February 22, in London, Mr. J. W. Hope (chairman and managing director) said that in addition to the troubles caused by an explosion, further misfortune had occurred through a serious fire. Over £18,000 had been allocated to reserve, bringing up its total to £70,000, which more than covered the amount standing at credit for goodwill. The whole of the reserve fund was invested in Government securities.

Early last year the products of the Company's oil-seed crushing mills for the manufacture of foodstuffs had been commandeered by the Ministry of Food, and more recently restrictions had been put upon the disposal of oils and oil cakes; but the Ministry of Food had, on the other hand, assisted them in procuring raw materials for the oil mills, and the oil-seed crushing trade had been allowed a fixed margin of profit, which, he thought, was generally satisfactory. The national work undertaken by the Company included the supply of large quantities of glue for military purposes, and its tallow-melting plant had treated large quantities of fat obtained from the camps in the United Kingdom and in France.

A vote of thanks was passed to those soap manufacturers who had afforded valuable help on the occasion of the complete destruction by fire of the Company's toilet soap factory.

THE BRADFORD DYERS' ASSOCIATION, LTD.

Speaking at the ordinary general meeting, held in Bradford, on February 28, the chairman, Mr. M. S. Sharp, referred to the big combination of German colour and chemical works, with a working capital approaching £57,000,000, and to the investment of £35,000,000 in the United States to establish the dyeing industry there, and said that we could only hope to contend against such combinations by invoking the aid of powerful organisations like Brunner-Mond's, Castner-Kellner's, the United Alkali Co., the two premier London gas companies, and others. We also needed the driving force which has been well shown in the production of high explosives and other munitions of war. British dye manufacturers have made great strides, but much more remains to be done. A great responsibility rests upon the Government to foster the interests of the dyeing and textile industries, the latter alone employing more than one and a half million workpeople. From the first month of the war the directors had not ceased to urge upon British colour makers the vital importance of unity of effort, but the result had not been satisfactory—there was a complete absence of the co-operative spirit, and jealousy and strife had been rampant.

COURTAULD'S, LTD.

The net profit for the past year was over a million sterling, and the directors propose that a final dividend of 17½ per cent., less income tax, be paid, making 30 per cent. for the year. It is further proposed to value the holding in the American subsidiary, the Viscose Company, at £6,444,480, to capitalise the reserve (about £8,000,000), and to distribute two 6 per cent. Preference shares of £1 each and two additional Ordinary shares of £1 each for every one share now held. This will involve raising the capital from £2,000,000 to £10,000,000, and the proposal is now before the Treasury. The shares, which stood at about 2¼ before the war, now stand at over 8.

BOOK REVIEWS.

The Book of the Rothamsted Experiments. *By Sir A. D. Hall, F.R.S. Second Edition. Revised by E. J. Russell, F.R.S. pp. 332 (London: J. Murray. Price: 10s. 6d. net.)*

Agriculture is certainly the oldest of the sciences, and up to a few years ago one might have written the least appreciated, at all events in this country. If to-day, when war conditions have proved that it is the most important of the nation's industries, agricultural science is able to come to the rescue of the nation in its need, it is largely owing to the work done at Rothamsted, with which the names of Lawes and Gilbert and their devoted band of loyal assistants will ever be associated. The history of the station is too well known to need repetition. The foundation dates from the engagement by Sir John (then Mr.) Lawes of a young chemist, Dr. J. H. Gilbert, in 1843, to take charge of the scientific superintendence of the agricultural experiments he was carrying out, which arose out of his controversy with Liebig. Lawes and Gilbert worked together for 57 years, and Sir John during his lifetime set aside Rothamsted as an experimental station, and endowed it so that the researches might be continued after his death, the management being vested in a Committee appointed by certain scientific societies. After the death of Sir Joseph Gilbert, Mr. A. D. Hall, and later Dr. E. J. Russell, became Directors in turn. The fact that to-day the former is Permanent Secretary to the Board of Agriculture offers no small guarantee that the application of science to agriculture will not be overlooked by the State.

During his period of office, Mr. Hall carried on the experiments and traditions with conspicuous success, and further set himself the task of interpreting them in terms which should be intelligible to the ordinary practical farmer and non-scientific reader; his successor, Dr. Russell, has been equally fortunate in achieving both these objects. As a consequence, the lessons to be derived from the Rothamsted experiments have been made available to the widest possible public, and it is not going too far to claim that a knowledge of them should be acquired by every Englishman who claims to be well read.

The work before us is a second edition, brought up to date, of Mr. Hall's account of the experiments, and includes a new chapter written by Dr. Russell, which summarises the very important investigations made during the past ten years on the biochemical processes in the soil: these have been described from time to time in this Journal.

The Rothamsted experiments are a model in every sense of the word, and they should be studied by all chemists in whatever branch of the industry they may be engaged. Nowhere else have experiments of such great economic importance been made with so much indifference to all else than scientific thoroughness. Thus, wheat has been grown on the world-famous Broadbalk field continuously for over 70 years, the annual manurial treatment being substantially the same since 1852. We know of no other experiment which has lasted so long. Equally historic is the fact established by these experiments that, in spite of continuous growth for nearly three-quarters of a century, the field which has received no manure whatever has yielded a crop averaging 13 bushels to the acre, which is about the average production of the great wheat-growing areas of the world.

Even more interesting are the plots on which the effect of various manures on the permanent meadow is being studied. Originally the herbage was uniform throughout, but as the result of the application year after year of nitrogen to one plot, potash to another, phosphate to a third, and so on, the flora of the various plots has become very different. The writer knows no more striking sight than a visit to this field during June, whilst to the chemist the curious selective action of the different manures will be in the highest degree suggestive and stimulating.

Quite apart from the absorbing interest of what has been accomplished at Rothamsted, but of equal or even greater interest to us to-day, are the problems awaiting solution. One of the newer conceptions in nutriton, both of humans and animals, is that of quality in addition to quantity. The practical farmer knows that there is an immense difference in the fattening value of different pastures, though the growth in each case may appear equally luxuriant. An explanation of this fact has still to be sought: botanical analysis gives no clue to the differences, and much patient research involving all the newest fields of biochemistry will be required.

Such problems can only be tackled in the Rothamsted manner. They require much time for their investigation, the compilation of accurate and careful data, and very considerable resources in material and money. Nutrition problems of all kinds are of paramount importance for our immediate future, and it is to be hoped that many of the large firms whose interests are connected with foodstuffs will come forward to endow Rothamsted liberally, so as to enable it adequately to undertake such investigation. It has been stated, for example, that a herd of some 500 beasts is required to make a satisfactory experiment on cattle feeding, such as would have afforded the information so badly required at the present moment as to the most economical period of slaughter.

The problems of the utility of the various chemical manures are likewise far from being completely exhausted—new commercial products are being offered to the farmer, who must use them in the proper manner if the best results are to be obtained. By-products of other industries are being used as manures or cattle foods.

E. F. Armstrong.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

ECONOMIES IN THE USE OF FUEL UNDER PRESENT CONDITIONS.

Although the recent rapid advances in the price of coal and the proportionately greater advances in the price of slack for works purposes have compelled a few of those who are distinctly interested to give some attention to the subject of economies in the use of fuel under present conditions, there is still, generally speaking, an astonishing tendency to perpetuate the attitude of indifference that has been so striking a characteristic of the past.

It is difficult to eliminate the old idea that, so long as the heat and power necessary for running mills, factories, etc., can be obtained by some means, there is no need for anxiety, because, if the required output can be secured, a few additional shillings per ton in the cost of the fuel is a detail that appears very small in the final balancing of costs.

There is now, however, a new and more serious factor operating, viz., that of depreciation in the quality of the fuel. This depreciation, which was noticeable in 1916, became much more pronounced during 1917, and if the ratio of deterioration is maintained throughout the current year, it will compel the attention of manufacturers, as the effect in curtailing output will be serious.

This can be demonstrated by considering the case of a factory having 20 Lancashire boilers, each capable of burning 1000 lb. medium slack per hour, and evaporating 1—8, from feed-water at 130° F. to steam at 70 lb. pressure (a fairly average set of conditions) with two of the 20 kept as spare boilers for emergencies, cleaning, etc. The total hourly evaporation is therefore $1000 \times 8 \times 18 = 144{,}000$ lb. of steam. If the slack deteriorates to such an extent that only 800 lb. can be burned per hour and the evaporative power falls to 1—7, the hourly evaporation becomes $800 \times 7 \times 18 = 100{,}800$ lb. of steam per hour. If the two reserve boilers are put on, an additional 11,200 lb. of steam are obtained or a total of 112,000 lb., *i.e.*, a net diminution of 32,000 lb. per hour. This case is by no means an exaggerated one, and does not presuppose the substitution of slacks of the lowest grade, such as many works have reluctantly become acquainted with during 1917.

A rather elusive phase of this question relates to supposed calorific values as determined by ordinary laboratory methods. The difficulty of obtaining a reliable sample even when following the most careful and up-to-date methods of sampling is well known. In some works the wise precaution is taken of weighing the whole of the ashes from a boiler, or from a battery of boilers, the proportion of ash carried up the flues being estimated and the percentage of combustibles remaining in the ashes determined by analysis. The amount of ash in the fuel is by this method ascertanied by tests taken over periods of a week, or longer if desired, and the figures thus obtained are used as a basis for correcting laboratory figures, which may be inaccurate through unavoidable difficulties of sampling. The water content of the fuel is usually almost uniform throughout a waggon of slack or coal and the figure for water, obtained by ordinary laboratory methods, may be assumed to be correct. It will be obvious, therefore, that by using the new ash figure, as determined by the actual combustion of possibly hundreds of tons of fuel, as a corrective factor the proximate analysis may be checked, as also the figure obtained as representing the calorific value of the fuel, whether determined by calculation from analysis or by calorimetric methods.

With very low grade qualities of fuel, another difficulty, however, presents itself, *viz.*, the calorific power of the fuel, however carefully and accurately determined, is misleading. When comparing good with medium quality fuel, the calorific values give fairly an approximate idea of their values for works purposes, but in a comparison of good or medium fuels with those of very inferior quality, the method is unsatisfactory. It does not follow that the real value of a slack for steam raising that is found to have a heating value of 9000 B.Th.U. when compared with one of 13,000 B.Th.U. is on the ratio basis of 9 : 13. The real ratio is determined not only on a basis of simple chemical combination because there are also physical and other miscellaneous factors to be taken into account. For example :—

(A) Length of time required to clinker. (B) Decrease of efficiency during clinkering. (C) Number of hours between clinkerings. (D) Length of period of highest efficiency of combustion. (E) Time required after clinkering before the period of highest efficiency is reached. (F) Relative fusibility of the ash.

The last item is important, especially when the percentage of ash is very high, and not only affects detrimentally the life of the fire-bars, but also interferes with the efficient distribution of air in the boiler furnaces.

In pre-war days it was the custom in the laboratory of a large South Lancashire works to classify unwashed semi-bituminous slacks under six headings in respect of percentage of ash, viz., 1st, very good ; 2nd, good ; 3rd, higher medium ; 4th, lower medium ; 5th, inferior ; 6th, very inferior.

Under the first heading, slacks in which the percentage of ash did not exceed 5 were included. Under the sixth heading were slacks containing 20—25 % of ash. The other qualities, 2, 3, 4 and 5, ranged from 5 % to 20 %. In 1916, large quantities of slack containing 20—25 % were received, but in 1917 a still lower grade ranging from 25—35 % made its appearance and was described as " almost unburnable."

Losses under the conditions obtaining at present in most works may be summarised as being due to :—1, Increased price ; 2, inferior quality ; 3, extra labour required at boilers and clinker heap ; 4, hindrance of departments through shortage of steam ; 5, increased overtime from the same cause ; 6, reduction of output ; 7, bad effect on quality of output.

It may be argued that the difficulties referred to could be overcome to some extent by increasing the number of boilers or by the introduction of artificial draught, but increase of boiler plant is in most cases out of the question under present conditions, as is also the introduction of artificial draught.

But even if we assume that the conditions obtaining in most works would allow for such extensions and modifications of existing apparatus, and that the necessary materials could be procured, is the policy a sound economic one either from the manufacturing or the national point of view ?

Would it not be wiser if those in authority, in attempting to solve the problem, were to commence at the right end by arranging for efficient supervision at the collieries ?

The cost to manufacturers, and thus indirectly to the nation, which results from the suspension or inadequacy of the usual cleansing processes at the collieries is many times greater than any saving which can be arrived at by this stinting of labour at the source of the fuel. It is probable, also, that for every man who is liberated for service in the Army on account of laxity in this direction at least five extra men are required in the various works to which the fuel is consigned.

INDUSTRIAL CHEMISTRY AT THE INDIAN INSTITUTE OF SCIENCE.

G. J. FOWLER.

The Indian Institute of Science, Bangalore, founded by the late Mr. J. N. Tata, as a Research Institute for India, was opened for students in 1911, and its activity and usefulness has steadily increased since that time.

During the past few years the Institute has taken an increasing part in the chemical research connected with the new industrial development which is taking place in India. Details of the work done are given in the recently-issued annual report on which the following account is based :—

A most successful outcome of research carried on at the Institute by Drs. Sudborough and Watson has been the starting by the Government of Mysore of factories in Bangalore and Mysore for the distillation of sandal-wood and recovery and purification of the oil. This industry has already been a source of great profit to the State. A series of experiments on wood distillation has also been carried out in the Department of General and Organic Chemistry.

Other technical researches which have been carried out in this Department are, the investigation of ginger grass oil, of naturally occurring alkaline earths, the testing of furnace linings, and analysis of oil seed cakes.

The most important work in the Applied Chemistry Department has been research undertaken at the request of the Government of India in connection with the manufacture of acetone by the fermentation process which will be adopted at the Government Acetone Factory now under construction. Under the immediate direction of Major E. Moore Mumford, a complete experimental plant has been set up in the Department which is enabling a thorough study to be made of all the most important problems of this new and difficult fermentation on a practical scale before actually beginning operations at the factory.

In addition to this work, research of a practical character has been carried out in the following directions :—

The flower of the *Bassia Latifolia*, known as "mahua," occurs in large quantities in many parts of India, particularly in the north-west and in the State of Hyderabad. The flowers on maturity contain about 60 per cent. of sugar, mainly glucose, and a decoction of them is readily fermented in various ways and forms an especially cheap source of alcohol. Experiments have been directed towards improving, and consequently cheapening, the fermentation process with the special object of providing a motor spirit in substitution for petrol, and as a result of the work done large scale production of a motor spirit with alcohol as a main constituent is likely to be started in Hyderabad. The further fermentation of alcohol to acetic acid by up-to-date methods is also being studied.

The production of a palatable syrup from mahua extract by suitable methods of purification has met with some success.

Interesting work has been done on the subject of indigenous dyes, and the possibility has been shown of producing a number of them in a form convenient for use so that they may find application in special directions at any rate for some time to come.

The important question of shellac, lac dye and lac varnish, has received much attention, and possibilities of extending and improving the scientific culture of lac in new districts have been indicated.

Assistance has been given to the Government of Mysore in the production of soap for which a factory is shortly to be started.

Recently the production of gelatine and glue from bones and other animal products has been investigated in order to determine data for starting large scale manufacture.

The study of activated sludge is being taken up in connexion with the disposal of the sewage of the Civil and Military Station at Bangalore. The firm of Tata Sons is starting a Research Department on the subject in connection with the sewage disposal of the town of Sakchi, which has sprung up in connection with the Tata Iron and Steel Works, and particularly with reference to the agricultural possibility of this material when mixed with the fertilisers now produced as by-products by the Iron and Steel Co.

At present the staff of the Institute are all closely engaged at the instance of the Indian Munitions Board on work relating especially to needs imposed by war conditions. Such problems are the production of white lead, the electrolytic refining of used copper (undertaken by the Department of Electrical Technology), the production of glycerine, the production of varnish suitable for railway stock, etc.

From this résumé it will be seen that the varied activities of the Indian Institute of Science in the field of chemistry are constantly increasing and are likely to have an important influence on the future industrial progress of India.

The present Director of the Institute is Sir Alfred C. Bourne, and the departments concerned with chemistry are as follows :—Department of General and Organic Chemistry : Head of the Department and Professor of Organic Chemistry, Dr. J. J. Sudborough ; Professor of General Chemistry, Dr. H. E. Watson. Department of Applied Chemistry : Prof. Gilbert J. Fowler ; Assistant Professor for Mechanical Engineering, Mr. J. H. C. Kann.

The Institute contains a library of chemical and electrical literature, under the charge of Mr. C. F. H. Tacchella, which is probably the most complete in India.

PAPER YARNS AND TEXTILES.

J. F. BRIGGS.

The important development of the paper yarn and textile industry in Germany and Austria during the war, in consequence of the dearth of imported fibre materials, has been the subject of frequent comment in the daily Press and technical journals (see this J., 1917, 543). Samples of these textile substitutes can now be inspected at the Department of Oversea Trade (Development and Intelligence), and the *Board of Trade Journal* of February 14 contains a special article dealing with the manufacture of these goods. Two methods of spinning appear to be in common use.

One of these has been employed in this and other countries for some time before the war and was described in a lecture before the Textile Institute in Manchester by Hellberg in 1911 (see this J., 1911, 1008) ; it seems to be a thoroughly practical proposition. The paper, purchased in reels, is slit by a slitting and re-reeling machine into strips of the desired width. These narrow bobbins are then mounted on a separate machine from which the strips are led over a damping roller revolving in a trough containing a suitable solution, thence between two horizontal rollers and through a circular guide which twists the edges of the paper inwards, and so to a traveller running on a horizontal ring, whereby the spinning or twisting operation is completed. In a modified form of this process a "flyer" is adopted, especially when it is desired to make paper yarns with hemp or jute core. In one type of machine the mechanism is so arranged that

the damping of the strips occurs just before the twist takes place, and if the machine stops, the twist of the strips extends backwards over the damping roller so that a flat surface is not exposed to the damping during the period of the stoppage.

Another method of spinning is carried out by the "pan-spinning" machine (*Tellerspinnmaschine*), in which the reeled strips are inserted in round flat covered pans. The inner ends of the strips are led up to bobbins through apertures in the covers of the pans and twisting is effected by the rotation of the pans. Cores of yarn or wire may be embodied in the product as the strip leaves the aperture. The damping may be effected by dipping the pans bodily into the solution or by arranging a damping roller between them and the spindles. The character of the yarns is determined in the first place by the character of the paper and secondly by the nature of the impregnating solutions employed for damping; the effects of various sizing and impregnating reagents have already been described (this J., 1917, 287, 592).

Some of the German samples now on view consist of 40% of twisted paper, 40% of cotton and 20% of wool waste or shoddy. Clothing material of fair appearance has been made by alternating wool and paper yarns two by two. However acceptable such goods may be as a wartime substitute, opinion as to the permanent status of the industry is consistently cautious in technical circles, even in Germany. As a substitute for jute in twine, bagging or carpet matting, there are greater possibilities than in the case of clothing, and the question will become one of relative price, always bearing in mind the greater susceptibility of the paper fabrics to damage by water. The quality of the German and Austrian samples exhibited is not considered superior to that of similar materials produced in the United Kingdom. The quantity of jute imported into Germany and Austria prior to the war amounted annually to 160,000 tons, valued at 160,000,000 marks (£8,000,000). At the end of 1917 the daily production of paper yarn was about 100 tons, and the number of persons engaged in the industry about 15,000. The kind of paper most suitable for making the strong coarser grades of paper yarns is "Kraft" paper prepared from sulphite pulp, most of which is imported from Sweden.

OFFICIAL NOTICES OF THE SOCIETY.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Society will be held this year at Bristol on July 17, 18, and 19.

APPOINTMENT OF HON. TREASURER.

Mr. D. Lloyd Howard, of Howards and Sons, L'd., of Ilford, has been appointed Honorary Treasurer of the Society of Chemical Industry in succession to the late Mr. Thomas Tyrer.

Death of the late General Secretary.—We much regret to announce that Mr. Charles Cresswell, for many years General Secretary of the Society, died suddenly on March 23 last at Ashtead, Surrey. The funeral took place at Ashtead on March 27, the Society being represented by Dr. J. P. Longstaff and Mr. T. F. Burton.

THE PROFESSION OF SCIENCE.

THE NATIONAL UNION OF SCIENTIFIC WORKERS.

N. R. CAMPBELL.

So many new associations of scientific men are being formed that the situation is nearly as dangerous as it was a few years ago, before any attempt was made to apply to scientific workers the form of organisation which has proved essential to the welfare of other professions. People, bewildered by a multiplicity of societies, are apt to end in joining none of them; and even if all the profession is ultimately enrolled in one or other of them, the mere division, quite apart from a jealousy which might arise from what is now a healthy rivalry, must detract seriously from the strength of each; for in such societies numbers are strength.

It is clear that some working arrangement will have to be made between these associations, and it is equally clear that the National Union of Scientific Workers, which can include all who are eligible for any of the other societies and will be organised in branches practically autonomous, offers a mechanism through which the necessary arrangement may be reached. It would be premature to consider what that arrangement is to be; at present I want to urge some arguments in favour of an all-inclusive society, such as that which I have the honour to serve as General Secretary, in contrast to societies which include only some section of scientific workers.

In the first place the mere increase of numbers will be a source of additional strength; even if there were few interests common to all branches of the profession, the various sections might lend each other effective support in pressing their separate claims. In the second place, a programme framed in a common union would avoid the dangerous possibility of antagonism where interests are not completely the same. Lastly, it appears to us most important that workers in the same institution or under the same employment should be members of the same branch, even if they practise different sciences; it would be disastrous if the workers in a university, a research institution or a government department were divided among several societies. The organisation which we propose is similar to that which the experience of the labour Trade Unions has led them to substitute for the older "craft unionism."

But what are our aims and how do we mean to attain them? Our aims are such interests, economic or other, of our members as can be promoted by corporate action; our methods are those which will utilise a strength arising from all-inclusiveness. We want to employ in the interests of science and its workers the power in the political and industrial world which is becoming more and more closely associated with the form of organisation we adopt. We shall claim representation on all Government committees and public bodies concerned with our interests and on the Joint Industrial Councils, which we shall try to get extended to scientific industry. We shall draw attention through the Press, perhaps through a journal of our own, to all cases of individual hardship. We should set up a Parliamentary Committee and support, probably in connection with university representation, a candidate pledged only to promote the interests of the scientific world. We should set up an employment bureau, the use of which would be open only to those who accepted the scale of salaries and conditions of work laid down for each section of the profession by those of our members who belong to it. A legal department, giving free

advice to members on questions affecting their work, is another obvious sphere of activity.

But I have occupied the space allotted to me by the editor, and must ask those interested to apply for further information. I would only remark in conclusion that we have made our provisional organisation as elastic as possible so as to provide for extension in any direction. Accordingly, those who think that our work is not quite on the right lines should hasten to join the Union and deflect it in the direction they desire.

THE PROFESSION OF CHEMISTRY.

BRITISH ASSOCIATION OF CHEMISTS.

At a representative meeting of chemists of the Birmingham district, held at Birmingham University on February 28, Mr. E. W. Smith, the chairman, outlined the work of the National Executive appointed at the Manchester meeting on November 10, 1917. The Executive had acted up to the spirit of that meeting rather than attempted to carry out its instructions literally. At that time the movement was confined to Manchester and Birmingham, but now there are ten local sections in actual existence or in the process of formation. It has been decided that the Executive shall consist of one member from each section.

With reference to the state of the negotiations with the Council of the Institute of Chemistry (this J., 51 R), Mr. Smith pointed out that as a result of a recent meeting, the proposals outlined in the B.A.C. report of February 1 had been amplified. The Council was prepared to drop some of the saving clauses, and also the age limit of 27 years in the case of candidates presenting themselves before December 31, 1921—a point on which it was more than meeting the suggestions of the B.A.C. Executive. The Institute also favoured the formation of local sections, and was prepared to revise the method of election of the Council.

The Council of the Institute was not desirous of setting up within itself a self-governing sole registration authority for all chemists; the only method it could adopt was to increase the number of Associates. The Institute wished to look after the interests of all chemists, and would very shortly undertake to form a register of lower grade chemists after a satisfactory settlement had been arrived at with the B.A.C. In the near future it was anticipated that the Council of the Institute of Chemistry and the Executive of the B.A.C. would publish a joint report addressed to all chemists in the country.

The following resolution, moved by the Hon. Secretary, Mr. F. C. A. H. Lantsberry, and seconded by Dr. A. Parker, was carried unanimously:—

> "That this meeting of Birmingham and district chemists welcomes the statement that the Council of the Institute of Chemistry is prepared to carry out the aims and objects of the proposed British Association of Chemists, and considers that the proposed modifications in the qualifications for membership of the Institute of Chemistry agreed to between the Council of the Institute and the Executive of the B.A.C. will reasonably ensure the inclusion of all qualified chemists."

In reply to points raised in the discussion, Mr. Smith explained that it was considered that a pass degree plus experience was equivalent to a degree with honours, and that if the ideas of the B.A.C. were carried into effect, the registration authority set up by the Institute would have to cover all qualified chemists.

At a meeting of chemists of Glasgow and district held on March 15 under the auspices of the Glasgow Section of the Society of Chemical Industry, it was decided to form a Glasgow and West of Scotland Branch of the Association. The following were elected members of the local committeee: Prof. T. Gray, Drs. Cruikshanks and Ewing, Messrs. W. H. Coleman, L. Hislop, J. Macleod, W. Moodie, D. A. MacCullum, F. McMillan, A. B. Steven, W. W. Wilson, and Miss E. Kennedy.

CORRESPONDENCE.

THE PROFESSION OF CHEMISTRY.

SIR,—In view of the agitation which is going on in the direction of placing chemists on a proper footing in the professional world, may I make the following suggestions?

That a joint committee consisting of members of the Institute of Chemistry, the Society of Chemical Industry, the Chemical Society, and the Society of Public Analysts be formed for the purpose of approaching Parliament with a view to:—

1. The amendment of the Pharmacy Act, 1868, in the direction of extending the definition of the term "Chemist" to other than pharmacists.

2. The passing of an Act, to be called The Chemistry Act, 19—, with the object of controlling the members of the professions of consulting, analytical and technological chemistry in business in the United Kingdom, and of placing them on a recognised footing in relation to the public.

The chemists coming within the meaning of this Act to consist of all persons who, at the time of the passing of the Act, shall be carrying on the business of consulting, analytical or technological chemists, or who shall be subsequently registered as such under a qualification to be determined.

The provisions of the Act to include the formation of a Council of which the constitution might consist of members nominated by the various recognised Societies and Institutions as given above, together with nominees of the Crown. The duties of this Council under the Act to be (1) to keep a register of consulting, analytical and technological chemists, (2) to fix the qualification for registration of such consulting, analytical and technological chemists as shall not be in business at the time of the passing of the Act, (3) to deal with unprofessional conduct on the part of registered chemists, and to take proceedings against unregistered persons carrying on business as consulting, analytical or technological chemists, powers for these purposes being given in the Act; (4) to carry out in general the provisions of the Act.

The above would in no way interfere with the operations of the present chemical societies and institutions.

I also beg to suggest that, in order to safeguard the political and economic interests of chemists coming under the operation of the Act, that an association be formed on the lines of the British Medical Association. This was pointed out as being feasible by one of the speakers at a recent meeting of the proposed British Association of Chemists in London.

I am, Sir, etc.,

Feb. 21, 1918. F. I. SCARD.

NEWS FROM THE SECTIONS.

BRISTOL.

The members of this new Section met on February 19 at the University, Bristol, to hear an address by Mr. E. F. Hooper on the subject of "Our Society and its Activities." Dr. T. Howard Butler was in the chair. In view of his experiences as Hon. Secretary of the Newcastle Section, and as a member of the Council, Mr. Hooper was well qualified to do justice to his subject, and his remarks were listened to with much appreciation by the members present.

Taking as his text the three primary objects for which the Society was founded, the speaker said that the promotion of Applied Chemistry was not only to be brought about by attending meetings, reading papers, and joining in discussions, but by bringing together chemists in different branches of the industry in order to cultivate a spirit of co-operation. He suggested that the Society might with advantage take up a definite attitude with regard to the decimal system, might work for improved standardisation in sampling and testing products, assist in improving chemical nomenclature, act in an advisory capacity on the packing of materials and on methods of transport, watch over railway legislation in so far as it affected chemical industry, and co-operate with the new Association of British Chemical Manufacturers.

Passing to what was being done, Mr. Hooper alluded to the work of representatives of the Council on Government Commissions and Committees, and on the Executive and Council of the National Phyical Laboratory.

Among the numerous sub-committees of the Council, one is hard at work producing a complete bibliography of chemical journals and cognate literature; another is tackling important problems connected with Reconstruction; a third is dealing with Patent Law Reform; and a fourth with the International Catalogue of Scientific Literature.

Dealing next with the work of the Sections, Mr. Hooper advised the policy of decentralisation, *i.e.*, not to let all the work be done by one man, such as the Hon. Local Secretary. He strongly advocated the holding of informal meetings, and also recommended periodical visits to works, exhibitions of apparatus and chemical products, and the institution of courses of lectures. To meet the needs of members who live remote from the town where the meetings are usually held, it is a good plan to hold occasional meetings in other centres; and good would also result if papers read before one Section were to be discussed at others, after they have appeared in the Journal. To increase the membership a good district directory and personal letters addressed to heads of firms will yield a surprising crop of new sympathisers and members. Mr. Hooper concluded his address by referring to the recent development in the scope of the Journal, and to the arrangements with the Chemical Society to prevent overlapping of abstracts in the Journals of the two Societies.

MANCHESTER.

The monthly meeting of the section was held on March 1, when Mr. L. G. Radcliffe read a paper describing "Some Physical and Chemical Properties of Hydrocarbon Oils Used as Insulating Media." Mr. W. Thomson presided.

Mr. Radcliffe expressed regret that he would be unable to give any information as to the nature and sources of the oils whose properties he had been examining. They were, however, all oils actually in use for insulating purposes.

The apparatus for determining the tendency of an oil to deposit sludge (J. Inst. Elect. Eng., Vol. 54, 1915, 497) was shown, and also an improved form. Attention was drawn to the change of colour of the various oils when submitted to the action of heat and oxygen under the conditions of the test, and reference was made at some length to the ease with which such oils underwent oxidation to give water, water-soluble acids, and insoluble fatty acids. Samples of these oxidation products were shown by the lecturer and mention was made of their action on metals. A relationship apparently existed between the amount of sludge deposited by an oil and the precipitate of "Formolite" produced by treating the oils with methylal after the manner suggested by V. F. Herr, this being a modification of Nastjukoff's test. This was still under investigation, and the results were given with all reserve.

Mr. Radcliffe again drew attention to the iodine values of the different oils in which the percentage of iodine absorbed coincided with the formation of sludge. (This J., 1916, 340.)

Various forms of apparatus for determining the volatility of oils were shown and the difficulty of obtaining comparable results was indicated. The other usual data for the oils were tabulated and their relationships explained.

YORKSHIRE.

At the meeting on March 11, a paper was read by Dr. J. A. Hanley, of the Agricultural Department, Leeds University, on "Lime and the Liming of Soils," special reference being made to conditions obtaining in Yorkshire. Prof. J. W. Cobb presided.

Of the many factors influencing plant growth, a deficiency of lime in the soil has become a serious "limiting factor" to crop production over very large areas in Yorkshire. In the case of grass land, in addition to the crowding out of good grasses, "sourness" gives rise to the formation of a peaty mat on the surface of the soil, and this has, in many cases, been a serious drawback to the ploughing-out (and subsequent cultivation) of grass land in the county.

It is found that "sourness" is most prevalent on the following types:—

1. Sedentary soils originally deficient in calcium carbonate: (A) Millstone grit soils; (B) Coal measures soils; (C) Moor grit and adjoining soils from the Estuarine beds in N.E. Yorks. 2. Soils from recent drift deposits: (A) River alluvial soils in industrial districts; (B) Sandy drift soils in Vale of York; (C) Peaty Carr land of East Riding.

The deeper soils derived from limestone rock are also often "sour," due to leaching, and instances of "sourness" have been found on carboniferous limestone, magnesian limestone (occasionally), and chalk. Soils not usually "sour" are:—Alluvial soils outside industrial areas, heavier drift soils, boulder clay soils, warp soils. "Sourness" is always emphasised by use of acid manures, particularly sulphate of ammonia, and by smoke. Serious cases of deterioration of good alluvial soils, due to effects of smoke, have been noted.

Of these, all but the lower magnesian limestone yield entirely satisfactory lime when burnt. The upper magnesian limestone rarely contains more than 2 per cent. magnesia, whereas the high proportion of this ingredient in the lower magnesian (usually 30 per cent. to 40 per cent.) limits its use to very "sour" (and preferably heavy) soils. Industrial areas in Yorkshire coincide with those areas on which soils are very liable to "sourness," and it is highly desirable that all suitable forms of waste and spent lime from industries should be made available for use on the land.

Two objections to many such forms of lime are (1) high water content and consequent stickiness, and (2) the presence of substances poisonous to plants. Such forms of lime found suitable are:—"Seconds" or small lime and refuse lime from lime works; waste ground chalk from whiting manufacture; some forms of burnt sewage; and waste carbonate of lime from the recausticising of soda. In addition there are other waste limes such as tannery waste lime, gas lime, carbide waste, etc., which may be harmful, particularly if applied too near the time of sowing, but are often quite safe if applied during the previous autumn.

EDINBURGH.

At the annual general meeting, held on March 12, the Hon. Secretary, Dr. A. Lauder, gave an account of the work and progress of the section during the past session. Six ordinary meetings were held, with an average attendance of 26, and a special meeting took place under the auspices of this Section in connection with the proposed British Association of Chemists. The informal meeting, held on January 15, was a great success, and the wish was generally expressed that similar meetings might become a regular feature of the programme. The success of the meeting devoted to a general discussion on Factory Operations was undoubted, and it is felt that meetings of this kind could well be repeated.

During the past session the section lost two members by death, Mr. R. D. Pullar and Mr. John Milne, Inverurie. Thirteen new members have been enrolled and 15 have transferred from other sections, making a total membership of 111, as compared with 93 for the previous year.

The following members of the Committee have retired by rotation:—Messrs. A. P. Laurie, J. D. Brunton, D. S. Jerdan, and S. Stewart; and Mr. J. S. Ford was compelled to resign the vice-chairmanship owing to ill health.

At the conclusion of the business meeting, Mr. B. D. Porritt read a paper on "The Isolation and Examination of the Textile in Rubber Proofed Cotton Fabrics."

After a brief survey of the methods of manufacture adopted by the modern proofer, the wide variety of materials for which quotations would be called for in the ordinary course of business was emphasised and illustrated by a selection of samples. While technical experience is generally sufficient to form a reasonably accurate estimate of the nature and general quality of such samples, it is frequently necessary to obtain exact information of the type and quality of the proofing and fabric and their relative proportions by weight. It was pointed out that though sufficient proofing for analysis could usually be removed by scraping the sample after softening in a solvent such as benzene, this treatment would leave the threads of the fabric still impregnated with proofing and in a condition quite unsuitable for an accurate examination. A method was therefore, required to separate the constituents of the proofing cleanly from the fabric and leave the latter unaltered either in texture or weight. After some preliminary experiments on material proofed with "pure" rubber-sulphur mixing, a procedure was worked out which gave satisfactory results with the more resistant "compounded proofings" containing mineral matter. A small sample is accurately cut out and subjected to a short preliminary extraction with carbon disulphide. This serves to remove any soluble organic matter and free sulphur present, and, in addition, swells and softens the remainder to such a degree that a large proportion can usually be peeled off without endangering the appearance of the textile. The partially stripped material is then subjected to hot extractions with petroleum "white spirit, and the textile residue washed with ether. After the textile residue has been analysed qualitatively for mineral constituents, these are removed by appropriate treatment, care being taken to avoid injuring the cellulose. The sample is finally weighed dry, and then passed on for textile analysis. While the results so obtained agreed with those arrived at in factory practice, the fact must not be overlooked that the small pieces of material employed do not constitute average representative samples, and that consequently the results are open to errors arising from uneven yarn, weaving faults and irregular spreading.

LIVERPOOL.

At the outset of the proceedings of the meeting held on March 15, Mr. A. T. Smith (chairman) referred to the loss the Society had sustained through the death of Mr. Thomas Tyrer, and paid an eloquent tribute to the many services he had rendered to chemical industry. Mr. W. Mansbridge then read his paper on "Pitch."

Pitch may be described as the black fusible residue resulting from the distillation of organic matter such as coal-tar, waste grease, oils, fatty acids, etc. By long-continued evaporation, or "natural distillation" as it is called, asphaltums and bitumens of various kinds are obtained as final products. While normally hard and brittle at ordinary temperatures, pitches can always be fused, their so-called melting point being used to grade them, though solubility in various solvents and resistance to penetration by a weighted needle are also useful criteria in this connexion.

Coal tar pitch is produced in the greatest quantity at present, while mineral oil pitch, which was formerly a waste product and burned largely under the stills, has now found a use, especially in America, for road making, architectural work, water-proofing, electrical insulation, and in the manufacture of anti-corrosion paints. Some crude oils give a hard pitch of a fine black colour, which is completely soluble in turpentine, etc., and is used in high-class black "Japans," *e.g.*, as bicycle enamel. The mineral bitumens and asphaltums are graded by their percentage content of mineral matter (ash), since on this depends the quality of the "finish" in the varnished goods.

"Rubber pitch" obtained from cotton-seed mucilage (a by-product in the refining of cotton-seed oil) is of interest. When the mucilage is treated with B.O.V. a black grease is obtained, and this, when made from American decorticated seed, yields on distillation a black elastic pitch which can be vulcanised. The finest "rubber" pitch is obtained from crude cotton-seed oil (*e.g.*, damaged oil). When blown from the stills by air blast it assumes the form of a black rubber-like sponge. Wool pitch, obtained from crude wool fat, is used as a lubricant in hot rolling mills since it stands a high temperature without losing its lubricating properties. Ozokerite and ceresine pitches are made into "finishing" wax, and are used as "heel-balls" by bootmakers, and also for cable insulation. Bone pitch is used by varnish makers to give a fine black colour to enamels.

The testing of pitches is still in an unsatisfactory state as no truly scientific scheme exists upon which to work, *e.g.*, the melting point should be determined under standard conditions in standard apparatus. Mr. Mansbridge illustrated the apparatus usually used, and also a simple form of it which he himself preferred. Details were also given as to the method used for determining the solubility.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF PUBLIC ANALYSTS.

At the meeting of this Society held at Burlington House, W., on March 6, with Dr. S. Rideal in the chair, the following papers were read:—"On a Case of Poisoning by Potatoes," by F. W. Harris and T. Cockburn; "Determination of Potash," by Bertram Blount; and "The Graduation and Calibration of Gerber New Milk Butyrometers," by F. D. Day and M. Grimes.

Mr. Blount described a general method of determining potash, which in his experience had proved to be the most accurate and reliable.

Messrs. Day and Grimes have carefully determined the conditions under which the Gerber test should be carried out, particularly as regards the calibration of the butyrometers, and have redetermined the volume of the scale divisions. They have also examined the fat obtained in the Gerber test, and have compared its properties with those of unchanged milk fat in order to determine whether the accepted coefficient of expansion and density for milk fat will hold good in the case of the fat of the Gerber test. They have found that the Gerber method gives very accurate results.

SOCIETY OF DYERS AND COLOURISTS.

At the March meeting of the West Riding Section of this Society held in Bradford, Mr. W. Harrison, of Leeds University, opened a discussion on "Theories of Dyeing," which evoked much interest.

The chemical theory, Mr. Harrison said, assumed that the fibres of wool, silk or cotton formed chemical compounds with the dyestuffs. In support of this theory Knecht proved that dyestuffs of homologous series were absorbed by wool in proportion to their molecular weights, but no evidence had been brought forward in favour of applying the theory to cotton dyeing. The mechanical theory was based on the observation that substances of an indifferent nature, such as glass beads and quartz powder, could be dyed to a small extent. Of these examples an explanation was afforded by the electrical theory. The surface tension theory had been shown to be untenable by Lewis ("Phil. Mag.," 1908, 1516, 499). In the electrical theory (compare Harrison "Journ. Soc. Dyers and Colourists," Dec., 1911) four factors were taken into account:—(A) The molecular movement of the dye particles; (B) the electrical charge on the dye and on the fibre; (C) the surface of the fibre, including that within its pores; (D) the size of the dye particles. The rate of dyeing was governed by the first two of these factors; the total absorption of dye by the last two.

In the discussion which followed, the author pointed out that the electrical theory was not opposed to the chemical theory but that it provided explanations where the latter theory failed. For example: while it was easy to explain chemically the liberation of free hydrochloric acid from sodium chloride by cotton and by quartz, on the assumption that these substances possessed faintly acid properties, it was difficult to explain chemically why all negatively charged colloids produced the same effect—for example, paraffin wax and colloidal gold. If chemists were prepared to admit that all these substances could combine with sodium to form sodium compounds, then the chemical and electrical theories would become identical.

THE CERAMIC SOCIETY.

"Magnesite and Magnesite Bricks" was the subject of the paper read before this Society by Mr. W. Donald, at Stoke-on-Trent, at the ordinary monthly meeting held on March 9. The value of magnesite as a refractory is related to its density, porosity, tensile strength, resistance under load at high temperatures, and to its chemical composition, and in addition to these data there is also required a knowledge of the effects of heating at different temperatures, in oxidising and reducing atmospheres, and with slow or rapid cooling. Very valuable information is often obtained from microscopic examination. The mode of occurrence and the characteristics of Austrian and Greek magnesite were then discussed. The Austrian mineral has a massive crystalline structure, and the Greek a fine crystalline structure. The former is chemically less pure than the latter; it contains less iron oxide, but this is uniformly distributed throughout the mass, whereas in the Greek product its distribution—and also that of the alumina and silica—is very irregular. When sections of bricks are fired at 1750° and 1850° C., the Austrian material shows no signs of alteration, but that from Greece exhibits a change in structure from small to large crystals.

Generally speaking, the magnesite bricks made in Great Britain fall under two types. One type is made from finely-ground material, the bricks weighing from 72—76 cwt. (sometimes to 80 cwt.) per thousand; the other type is made from less finely ground material the bricks weighing 82—86 cwt. (sometimes to 88 cwt.) per thousand. Microscopic sections of these two types are easily distinguishable, and by comparison with sections of calcined magnesite, it is seen that in British-made bricks a considerable percentage of particles remains in the state of calcined magnesite, and that the impurities surround rather than interpenetrate them.

Further effects of heat upon Greek and upon Indian magnesite were discussed, the main point being that with continued heating the structure of these minerals tends to approximate to that of Austrian magnesite. Crystal growth is favoured by the proper application of heat, and by the presence of impurity which is regularly distributed. The impurity-magma should be capable of penetrating into the finest interstices of the magnesite particles, and not merely of coating them; if this condition is unattainable, material with less impurity must be employed.

If the structure of the refractory is continually changing from the fine to the coarse crystalline state during use, increased porosity ensues, and the altering particles are exposed to the direct action of the slag, which enters the pores causing frothing and still greater porosity. In Greek magnesite which had been calcined at about 1750° C. in modern gas-fired shaft kilns, the conversion of crystalline particles was found to have taken place almost throughout the specimens drawn, but without perfect regularity of crystal growth, and if this fact were brought to the notice of the works management, a more uniform conversion to the massive crystalline state would probably be attained.

The result of using Greek magnesite bricks of British make in basic open-hearth furnaces, pig-iron mixers, Talbot furnaces, and electric furnaces, is on the whole satisfactory from the steelmaker's point of view; but difficulties are still met with, including spalling, inability to withstand the corrosive action of the basic slag, and failure to stand the great strain which occurs in the roofs of electric furnaces. The bricks which have given the best results in furnace linings are those which correspond most closely to the Austrian magnesite bricks as regards regularity of crystalline growth and microscopic appearance of the magma.

INSTITUTION OF CIVIL ENGINEERS.

A paper was read by Mr. Alwyne Meade on "Modern Developments in Gasworks Construction and Practice" before this Institution on March 6.

In spite of modern improvements, the introduction of scientific control, and the lavish installation of labour-saving machinery, the cost of manufacture of coal gas to-day is approximately the same as it was thirty years ago, and this fact is due solely to the abnormal rise in the cost of coal and transport, and more recently to increased labour charges. Analysis of the figures given by the three great Metropolitan gas companies shows the capital expenditure per 1000 cub. ft. was 11s. 2d. in 1906, and 10s. 0¼d. in 1916.

Referring to labour-saving devices, the author commented on the success of the new type of self-dumping grab, by the use of which it was possible to effect a reduction of 30 per cent. in the time taken to discharge a ship of given capacity. The telpher of the non-automatic type was described as a very good means of handling gasworks materials, particularly hot coke, its average speed being 10 times that of the ordinary hot-coke conveyor. Enormous saving of sensible heat has resulted from modern developments in the plant used in the retort house; whereas twenty years ago 28 lb. of coke were necessary to carbonise 100 lb. of coal, only 11½ lb. are required now. One of the most signal changes during the last decade has been the substitution of the mass system of carbonisation in place of the layer system of light charges. This has necessitated an alteration in the design of the stoking machinery employed, one of the latest machines being the discharger-charger capable of expelling the coke and of introducing the new charge of coal in a single stroke, the time occupied for this operation being about 60 seconds per retort.

The horizontal retort is in many respects still able to hold its own as regards results of carbonisation, but the vertical retort, whether continuous or intermittent, has the advantage of affording facilities for "steaming" the coal charge. By the introduction of this principle it appears to be possible to increase the B.Th.U. produced per ton of coal from 6 millions to nearly 8 millions, with a corresponding reduction in the quality of the gas amounting only to some 20 B.Th.U. per cub. ft.

THE INSTITUTE OF METALS.

The annual general meeting of the Institute of Metals was held on March 13 and 14 in the rooms of the Chemical Society at Burlington House, W. After the business proceedings had been transacted, Prof. H. C. H. Carpenter delivered the Presidential Address. Referring to the early history of the Institute, he showed how the membership had started in 1908 with less than 200, and had gradually increased to about 600 in 1912. The total remained not much above this figure until 1917, when it rose to 880, and is now over 900. The President then discussed the question of the education of the technical man. The work of the first two years at the University or Technical College should be devoted mainly to grounding the student in the fundamentals of science, and the main function of the third and fourth years should be to inculcate habits of independent thought and the critical spirit. At the end of this time the man should not only know how to get information, but also be able to evaluate it.

The first contribution was by Mr. J. Neill Greenwood on "The Constitution of the Copper Rich Aluminium Alloys; Part I. Relationship of Hardness to Constitution." The first part of this paper contained a valuable comparative study of the Brinell and Shore sclerescope methods of measuring hardness, the most important conclusions arrived at being: (1) With coarse structures containing constituents of widely different hardness, sclerescope tests must be made with great care and a large number of readings be taken. (2) For Brinell tests the specimens need not be thicker than 0·2 in. (load = 1500 kg.), but with the sclerescope the results are erratic with this thickness. (3) A wide variation in the smoothness of the surface is allowable with the sclerescope tests. (4) The Brinell hardness increases with the load up to 3000 kg., after which it is constant. The remaining part of the paper dealt with the application of hardness measurements to the constitution of copper-aluminium alloys containing between 100 per cent. and 84 per cent. of copper, from which the author deduced that, while the β solid solution contains the compound Cu_3Al, the compound Cu_4Al does not exist; and also that alloys containing β require to be annealed at 600° C. for periods, in some cases as long as 20 days, before they reach equilibrium.

The second paper, by Messrs. H. Rix and H. Whittaker, was on "Die-casting of Aluminium Bronze." The authors found that by using an alloy containing 7·5 per cent. aluminium and 3·5 per cent. iron excellent die castings of commercial value could be obtained.

Dr. Gulliver contributed a note on the size of crystal grains in metals and alloys, considering mathematically the relation between measurements in two dimensions and actual mean granular volumes for the case of approximately equiaxial grains. Interesting results are obtained, and it is clear that too much has usually been taken for granted in making measurements of this kind. True uniformity of granular dimensions is not common, and the effect of annealing is to increase the deviation from uniformity.

A note by O. W. Ellis dealt with the mechanical properties of lead-tin-antimony alloys containing not more than 30 per cent. of tin or antimony. None of these alloys have a higher tensile strength than 6·5 tons, or a greater elongation than 13 per cent., these figures being given by the alloy containing 9 per cent. of both tin and antimony.

At the evening session a paper entitled "An investigation on Unsound Castings of Admiralty Bronze: Its Cause and the Remedy," was presented by Prof. H. C. H. Carpenter and Miss C. F. Elam. The authors show that the best casting temperature for this alloy is about 1200° C. Pouring at 1400° C. always, and at 1000° C. generally, produces unsoundness. They collected and analysed the gases given off by heating samples of the cast alloy *in vacuo*, and found that these varied according to whether they were removed quickly or slowly. In the former case the volume was small, the hydrogen content low, and the H_2S- and SO_2-contents high. In the latter case the volume was larger and about 50 per cent. of it was hydrogen. Neither the quality nor the quantity of the gases vary markedly from sound to unsound castings. Further, it would appear that the gases are present in the copper from which the alloy is made, and once the gases are introduced it is very difficult to remove them.

In the discussion the question of the pyrometric control of casting temperature was raised, and the difficulties pointed out. It was suggested that, by analogy with steel casting, the proper way of obtaining sound metal was to retain the gases in solution, and not to remove them. In the case of steel this was done by the addition of small quantities of aluminium or silicon, and some such method might give good results in non-ferrous metals also. A note on the annealing of aluminium was taken as read. In the discussion, Mr. D. Hanson drew attention to the abnormally low silicon content (0·06% Si) of one of the alloys, and pointed out that the hardness figures followed the silicon content.

NEWS AND NOTES.

CANADA.

As a consequence of the work of the Imperial Munitions Board, Canada is for the first time in its history producing refined spelter and refined copper and there is an important increase in the output of refined lead. The natural result of refining Canadian spelter and copper is the local production of brass, and this again enables many articles made of brass to be produced from the metal of the Dominion. The value of the orders thus placed by the Board exceeds 200 millions sterling.

A reliable estimate of Canada's water-power resources is highly desirable and is now being completed. The first estimate of this kind was published in 1911 by the Commission of Conservation. Since then it has conducted water-power surveys of British Columbia, Alberta, Saskatchewan and Manitoba, and has secured additional data on the powers in other provinces and it now submits the following figures as being the latest available:—Ontario, total possible horse power 5,800,000, developed horse power 760,000; Quebec, possible horse power 6,000,000, developed 640,000; Nova Scotia 100,000, total developed 26,000; New Brunswick 300,000, developed 15,000; Prince Edward Island 3000, developed 700; the total possible horse power of Manitoba, Saskatchewan, Alberta, and North-West territories is estimated at 3,500,000, total developed in Manitoba, 76,000, Alberta 33,000, North-West territories *nil*, British Columbia 3,000,000 possible and 250,000 developed, Yukon 100,000 possible and 12,700 developed. The total for Canada is: possible 18,803,000, developed 1,813,210. The figures quoted are given with much reserve since it is practically impossible to arrive at exact amounts.

NEW ZEALAND.

A report is being prepared for the New Zealand Government on the development of hydro-electric power in the Province of Southland, where there is more undeveloped water power than in any other part of the country.—(*Bd. of Trade J., Mar.* 7, 1981.)

SOUTH AFRICA.

The growing dearth of fertilisers is causing much anxiety, and the Scientific and Technical Committee is making strenuous efforts to replace those previously imported by locally manufactured substitutes. At the present time importation has practically ceased, and there is no available supply to make good the deficiency. Phosphates are needed for maize and nearly all other crops, whilst nitrogen is essential for wheat and sugar. Attempts are being made to utilise the large deposits of iron-alumina phosphates known to exist in South Africa, and the technical aspect of this known problem is attracting much attention. About 200 tons per month of ammonium sulphate is being produced as a by-product by the Natal Ammonium Company, but it is practically all exported to Mauritius for the sugar plantations; very little is used in the Union, although export is only allowed after local demands have been satisfied. There is great need for educational propaganda. The principles of crop rotation, green-manuring, and fallowing are but little understood, soil analyses are but very seldom made, and in many instances acid fertilisers like superphosphates have been applied to acid soils.—(*S. Afr. J. Ind., Jan.*, 1918.)

GENERAL.

The Patents and Designs and the Trade Marks Bills.—On March 12, the President of the Board of Trade received a deputation from the London Chamber of Commerce and allied bodies in connexion with these measures which now stand before the House of Commons (this J., 1918, 2 R, 42 R). In his reply, the President said that the request that a new, short Bill should be introduced with the object of extending the life of patents with respect to the period of the war, was tantamount to placing patentees in a privileged class by themselves. Such a measure could hardly be described as very simple or inexpensive, and it might well prove to be contentious. The Bill introduced last Session had been held up entirely owing to lack of time, and for no other reason. The Board regarded it as of great importance. He did not approve of the introduction of the shorter Bill asked for, because its passage through the House would take approximately the same time as the longer one, and the latter could be made the means of extending the life of patents as well as of initiating other necessary reforms. He remained of the opinion that the present Bill should be proceeded with; any necessary alterations or extensions could be dealt with by way of amendments.

Regarding the Trade Marks Bill, he was surprised at the unanimous opposition shown to Part 2, but his Department would certainly take due account of the objections raised, and also make any alterations in drafting which would remove ambiguities. He and his colleagues had arrived at the conclusion that this part of the Bill was really necessary to the commercial interests of the country. Its underlying principle was to prevent anyone securing a perpetual monopoly for the manufacture of an article by the astute selection of a word which was part of the vocabulary of the day. The patents monopoly is strictly limited, why not the trade marks?

A New University for the East Midlands.—Further steps have been taken to advance the proposal of an East Midland University, with its centre at Nottingham. A detailed scheme has recently been approved by the Court of Governors of University College, Nottingham, and has received the sanction and support of the City Council. This scheme is the outcome of proposals made in June, 1913, and submitted to the President of the Board of Education in April, 1914. It provides for an area covered by no fewer than six counties, viz., Nottingham, Leicester, Derby, Lincoln, Northampton and Rutland.

By the scheme the Nottingham Corporation guarantees an annual income of £15,000—representing 5 per cent. on £300,000—and the Mayor has undertaken to endeavour to raise by voluntary contributions throughout the area concerned an additional £150,000, so that the sum of £450,000, the minimum amount considered necessary for the endowment of the new University, may be secured. The Mayor hopes to obtain the Charter during his present term of office.

A special feature of the scheme is the provision for higher technical instruction in the industries of the district, which include agriculture, coal-mining, engineering, lace, hosiery, leather trades and chemical industries. Agriculture is already provided for at the Midland Agricultural College, Kingston, which would become part of the University, whilst a department of Mining has been established at University College, and is liberally supported by the colliery proprietors of the district. Moreover, it is anticipated that the rapid expansion in the chemical industries of Nottingham and district will create a demand for highly trained workers, which it will be the function of the new University to meet.

Industrial Research.—A conference for the purpose of extending in the Midland district the Wool Association for Scientific and Industrial Research was held at University College, Nottingham, on February 26. The Duke of Portland presided, and Sir Frank Heath, Secretary of the Government Department for Scientific and Industrial Research, gave an address. Subsequently the following resolution was passed unanimously:—"That this conference of spinners, hosiery manufacturers, hosiery dyers, bleachers, and finishers, is of opinion that every effort should be made to take advantage of the Government scheme for scientific and industrial research, and that the best method would be to join the Wool Association for Scientific and Industrial Research, on the understanding that cotton played an important part in the district concerned, and that subscriptions might be divided between the Wool Association and the Cotton Association, and the benefits of both enjoyed."

Dye Research at Huddersfield.—Soon after the acquisition by British Dyes, Ltd., of the old-established works of Read, Holliday and Sons, Ltd., the authorities of the Huddersfield Technical College projected a scheme for the building and equipment of new premises for a coal-tar colour department, a proposal which was well received by the inhabitants, and especially by leading business firms, practical support being quickly forthcoming in the form of promised donations. Since this first forward movement the project has not made any substantial progress, but recently a special committee has been formed to give the new impulse that is needed. The committee includes representatives of British Dyes, Ltd., of Messrs. J. W. Leitch and Co., and the Deputy Mayor, and has power to add to its number. Apart from the building scheme, much has been done of late to improve and enlarge the equipment of the coal-tar colour chemistry department in its present accommodation.

There are two types of men in the laboratories, the works chemist, who is allowed to work in the laboratories at whatever time he may find convenient, and the graduate who is sent by his firm for full-time training in research work. There is also a special branch devoted to the examination of patents and processes with a view to possible improvements in industrial practice, and a considerble number of German patents have been investigated either at the request of manufacturers or for general information.

"*Cercle de la Chimie de Paris.*"—For some time past a number of French learned societies, literary as well as scientific, have had a common meeting place at the "Hôtel des Sociétés Savantes" in the Quartier Latin, but in view of the renascence of chemical activity, some of the leading chemical societies of France have decided to found a separate organisation and to instal it in a new building—to be called "La Maison du Chimiste." In addition to serving as a social rendezvous for chemists of all shades, the "Maison" will also contain separate suites of rooms for the different chemical societies, but the club rooms and large lecture theatre will be shared in common. There will also be an information bureau for the use of members, whose enquiries will either be dealt with privately or through the "Revue des Produits Chimiques," the official journal of the "Cercle." Thus the new organisation will not supplant any of the existing societies, but serve as a means of bringing chemists into closer contact, and of centralising and co-ordinating their activities, thus promoting the welfare of the whole body chemical. The "Cercle" has temporary premises at 54, rue de Turbigo, Paris, and further particulars may be obtained from M. Brezet de Beaufort, 145, Wool Exchange, Coleman Street, E.C.2.

"*La Société de Chimie Industrielle.*"—At a meeting held in the Chemists' Club, New York, on January 18 last, a local section of this new society was definitely organised, and the following officers were elected:—President, L. H. Baekeland; Vice-president, Jerome Alexander; Secretary, C. A. Doremus; Council: Messrs. C. Baskerville, M. T. Bogert, Ellwood Hendrick, R. E. Orfile, E. P. Verge, Henri Blum, C. F. Chandler, W. H. Nichols, G. E. Valabrégue, Henri Viteaux. Prof. Grignard and Lieut. René Engel, of the French Military Mission, were elected honorary members. The section has already about 160 members.—(*Science, Feb.* 15, 1918.)

Mineral Production in the U.S.A.—According to telegraphic information from Washington, which has been issued by the Press Bureau, the Secretary for the Interior has announced a plan for developing American mines which will release ships from the trade in importing minerals, and so make it possible to utilise them for other cargoes. Ships are now employed in bringing from abroad 2,000,000 tons of minerals yearly for the manufacture of munitions in the United States. American mines, it is said, are cap ble of supplying every mineral used in the manufacture of munitions Congress has, therefore, been asked for a special appropriation for experimenting. The development of new deposits and better methods of extraction, and the substitution of home materials will have the effect of making the United States permanently less dependent upon foreign supplies for essential minerals. The minerals mentioned are nitrates, sulphur, manganese, flake graphite, tin, mercury, potash, tungsten, antimony, chromite, magnesite and mica.

Magnesium Production in the U.S.A.—Prior to the war practically all of the magnesium used in the United States was imported from Germany, but since the stocks in this country were exceedingly small, it practically disappeared from the market in less than 12 months. The price reflected its extreme scarcity. In January, 1917, the American Magnesium Corporation was organised at Niagara Falls, N.Y., for the purpose of building a plant for the manufacture of magnesium and magnesium alloys. These works are now in operation and are producing the metal in such large quantities that the price has been greatly reduced and is rapidly approaching the quotations prevailing before the war.—(*U.S. Iron Trade Rec., Jan.* 24, 1918.)

Ferromanganese, Magnesite and Speller in the U.S.A.—The output of standard ferromanganese in the United States in 1917 exceeded all records. It was 257,831 gross tons or nearly 50,000 tons in excess of the previous high record of 208.389 tons made in 1916. It was twice the output of 1912 (125,378 tons). The striking and significant fact is the dwindling of the imports from England. In 1917 they were only at the rate of 3703 tons per month and had declined in the last half to 2150 tons per month. In 1913 these imports constituted one-half of the available supply of this important steel-making alloy but now they are only about one-sixth.

According to estimates by C. G. Yale, of the U.S. Geological Survey, the production of magnesite in California in 1917 exceeded that of all former years, being estimated at 215,000 tons. Until 1915 the United States produced only about 10,000 tons of magnesite annually, although it used 300,000 tons. The domestic supply came from California and the imported material came from Austria, Hungary and Greece. In 1916 the production in California jumped to 150,000 tons, but the imports, if the calcined material is computed as crude rock, fell to 93,000 tons. The supply therefore fell short of the demand.

The production of speller from domestic ore in 1917 is estimated by the U.S. Geological Survey at 574,994 net tons and the production from foreign ore at 92,757 tons, a total of 667,751 tons, compared with a total of 667,566 tons in 1916 (563,561 tons of domestic and 104,005 tons of foreign origin). This indicates practically the same production as in 1916, but a loss of more than $60,000,000 in value. Included is 28,175 tons of electrolytic spelter, of which a part was refined by electrolysis from prime western spelter. This was the product of five plants. The quantity of zinc dust prepared for market was over 7000 tons, and the output of secondary spelter was about 21,600 tons.—(*Iron Age, Jan.* 31, 1918.)

* * *

Tomato Seed Oil.—The tomato plant was formerly cultivated in France to a large extent, but its place has now been taken by the cultivation of plants yielding essential oils. Tomato culture has been removed from France to Italy, where, in the province of Parma, the average yearly crop amounts to 84,000 tons, from the seeds of which 600 tons of oil are recovered.

Maize Oil.—The recovery of maize oil has been made compulsory in Hungary, and it is hoped to obtain 1200 wagon loads compared with 300 last year. Maize oil is also recovered in Rumania, where one large mill in Bucharest alone produces daily 30 tons of maize oil and 90 tons of residue, which is used as horse fodder. It has been estimated that by degerminating the whole of the Rumanian maize crop sufficient oil would be produced to increase the daily fat ration in Germany and Austria-Hungary by 12 per cent.

Whale Oil.—The attempts made by the Danish margarine manufacturers to utilise Greenland whale oil for margarine were abandoned, as they were unable to remove the fishy taste. According to a report of the De-No-Fa Fat Hardening Works in Frederikstad, hardened whale oil can only be used for margarine when mixed with considerable quantities of vegetable fats. On the other hand a report of a commission appointed by the Norwegian Government declares that whale oil which was hardened only up to 35°—38° C. M.Pt., instead of to 40°—50°, as is usually the case, is an edible fat quite suitable for the purpose of margarine manufacture. Unhardened whale oil is also said to be suitable for preserving sardines and when mixed with vegetable fats can replace oleomargarine. The Leipsic Testing Station received a sample of a hardened edible whale oil with a striking resemblance to sweet hog lard, from which a very palatable margarine was prepared.—(*Chem. Umschau, No.* 12, 1917.)

World Production of Explosives.—Prof. Molinari, in a recent communication to the Italian Chemical Society, gives the following statistics relating to the world's production of explosives, which are based on information supplied privately to him, and which he considers to be approximately correct. The figures denote thousands of tons.

Country.	Before the war.	1915.	1916.
England	18	120	200
Germany	60	360	540
France	15	160	300
Italy	3·5	15	45
United States	8	100	160
Belgium	1	—	—
Russia	6	60	100
Austria-Hungary	5	90	150
Japan	4	50	90
Total world production	150	1065	1805

—(*Rev. d. Prod. Chim. Nov.* 15, 1917.)

PARLIAMENTARY NEWS.

British Aluminium Company.

Mr. Hogge asked the Secretary for Scotland what powers the British Aluminium Company has over the valley of the Spean and Treig; whether the valley is being converted into a dry gorge; and whether it could maintain many hundreds of people.

The Lord Advocate (Mr. Clyde): I understand that the company has not at present any powers over the valley of the Spean or of the Treig. My hon. Friend has probably in view the proposals affecting the districts mentioned which are contained in the private Bill which the company is promoting this Session, but these proposals have not yet obtained Parliamentary sanction, and the latter parts of the question do not, therefore, arise. (Mar. 7.)

Trinidad Oil Resources.

The Under-Secretary of State for the Colonies, Mr. Hewins, said, in reply to Mr. J. D. Rees, that 14 companies are at present engaged in the Trinidad oil industry: 365 wells have been sunk, 116 wells were actually being worked during November, 1917, and the quantity of crude oil products amounted to upwards of 4,500,000 imperial gallons. Applications for further oil licences and leases receive the careful consideration of the Colonial Office and of the Trinidad Government, but by far the larger part of the oilfield is already under licence or lease.—(Mar. 11.)

Fertilisers.

General Croft inquired of the President of the Board of Agriculture if the Board had made any calculation of the annual loss in fertilisers by the London County Council in not making proper use of the London sewage as recommended by the Royal Commission of 1884, and if he had any official information showing that the loss estimated by competent experts was over £500,000 per annum to the London ratepayers, and over £1,000,000 in extra food production.

Sir R. Winfrey replied that the Board was aware of the estimates of the kind referred to, but was advised that under existing conditions the cost of recovery for use in agriculture of the fertilising materials contained in the sewage of London would exceed their value.—(Mar. 12.)

Beet Sugar.

The President of the Board of Agriculture, answering a question put by General Croft, said that efforts are being made to secure a certain quantity of high-class beet seed, required for the projected sugar beet enterprise in Notts., from the United States and various countries in Europe. It is not yet certain whether delivery will be secured; in the meantime a sufficient quantity of seed at present available in this country will be sold in order to secure stocks for the future.—(Mar. 13.)

Feeding Stuffs.

Mr. Horne asked the President of the Board of Agriculture whether 12,000 tons of oil cake was imported into this country last September and has been warehoused ever since, and is deteriorating in quality; and, if so, whether the owners have refused to sell it at the prices fixed by the Government. Mr. Clynes informed the hon. Member that the amount of oil cake referred to was imported into the United Kingdom in September, 1917, and was warehoused in consequence of the refusal of the owners to sell at the controlled prices. It has now been requisitioned under the

Cattle Feeding-Stuffs (Requisition) Order, 1918, and is being distributed throughout the country. It has not, as a whole, deteriorated in quality.—(*Mar.* 11.)

Linseed Oil.

In reply to questions put by Mr. H. Nield concerning the delay in the release of linseed oil for the manufacture of veterinary medicines, Mr. Clynes said that the delay had been unavoidable, but in the meantime arrangements had been made whereby the Local Oil-Seeds Supply Committees provided supplies of oil for the purpose named in cases of urgent necessity. Mr. H. Nield also asked who was responsible for the decision that the use of linseed oil for the manufacture of paint, varnish and linoleum was of greater importance than for the treatment of cattle or for food cake. Mr. Clynes replied that no such decision has been taken. —(*Mar.* 19.)

Amber Size and Chemical Co.

In response to an inquiry by Mr. Joynson-Hicks concerning K. L. W. Bruckmann, who owned half the shares in the above company, and who had transferred them under pressure to F. W. Chambers, who is a director of W. H. Muller & Co., Mr. Wardle stated that the Advisory Committee had decided that the business was not one to which Section 1 of the Trading with the Enemy Amendment Act, 1916, applies. Mr. Bruckmann's ancestors were Hanoverians, some of whom had served in the British Army. He left Germany at 17 years of age, and had lived in England 21 years. The Committee did not recommend the vesting of his shares. The transfer of shares mentioned had taken place.—(*Mar.* 20.)

LEGAL INTELLIGENCE.

CONTRACT FOR THE SALE OF ALKALIS. *A. E. Smith v. Vulite Co., Ltd.*

In the Court of Appeal on February 20, Lords Justices Swinfen Eady and Bankes and Mr. Justice Eve heard the appeal of the plaintiff in the above action against the verdict and judgment at the trial before Mr. Justice Bray (Oct. 15, 1917), who gave judgment for the plaintiff for nominal damages amounting to 3s. Plaintiff now appealed from the finding that the damages could only be nominal. The defendants agreed to sell quantities of soda ash to plaintiff—200 tons of light alkali at £6 a ton and 100 tons of heavy alkali at £5 a ton. Before giving these orders to defendants, plaintiff had himself got firm offers for sending the alkali to France for the purpose of cleaning soldiers' clothes. Defendants refused to deliver, the reason being that there was an agreement between Messrs. Brunner, Mond and Co. and other manufacturers of alkali not to export, or allow their products to be exported, to France. Under that agreement it became necessary for the sellers to be satisfied that their material was not going to France. Plaintiff maintained that it was stated in the first place that the goods were intended for export, and he claimed damages on the basis of the difference between the contract price and the selling price of £13 and £15 per ton. Lord Justice Swinfen Eady, in giving judgment, said that there was no contract established by which the defendants were to sell for export. The real difficulty was that the defendants had no alkali available. They had to get it from Messrs. Brunner, Mond and Co., and they had entered into an agreement by which they were not to export alkali to the Continent.

His Lordship was of opinion that the plaintiff had wholly failed to establish that he had suffered any damage from the breach of contract, because the evidence put in by the defendants with regard to the current market prices showed that the current trade price of the alkali was £4 15s., and the lowest price at which plaintiff had bought from defendants was £5 a ton. In these circumstances he thought the Judge was quite right, the burden being upon plaintiff to establish what damage he had sustained by breach of contract. He had failed to discharge that burden. He had failed to show he had sustained any damage. Consequently, the Judge was right in giving only nominal damages. The appeal failed and must be dismissed. Lord Justice Bankes and Mr. Justice Eve concurred, and the appeal was dismissed with costs.

ACETONE DISTILLATION PLANT. *Blair, Campbell and McLean v. The Synthetic Products Co., Ltd.*

In the King's Bench Division on March 14, Mr. Justice Salter delivered his reserved judgment in the above action (this J., 1918, 38 R, 78 R). His Lordship said this was an action to recover £1075, the balance of an agreed price for a still sold and delivered by the plaintiffs to the defendants. The defendants, who had accepted the still and had paid part of the price, claimed to reduce or extinguish the price, and counter-claimed for damages, on the ground that the still was not in accordance with the warranty given on the sale. The onus was, therefore, on the defendants to prove the breach of warranty.

Before the war the defendants were engaged in experimental work on a commercial scale with a view to the production of synthetic rubber, and they had a secret process by which they fermented potato mash in a certain way, and obtained acetone and butyl alcohol. On the outbreak of war there was an unlimited demand for acetone for explosives. The Government offered to finance the defendants with a view to increasing their plant for the production of acetone. Defendants approached plaintiffs with a view to increasing the plant. The plaintiffs recommended a continuous still, and on this point they were entirely right. There were certain conferences and correspondence on the matter, and ultimately the defendants accepted an estimate of the plaintiffs for a plant producing daily 400 gallons of acetone and 600 gallons of butyl alcohol, at a price of £2150. The plant was to deal with 5000 gallons of potato mash daily. His Lordship found that nothing was said on either side which in any way varied the warranty contained in the documents. The acetone to be produced was to be up to Government standard. Defendants made a contract in writing with the Government that they should supply, and the Government accept, all the acetone the Company produced, the quantity being stipulated at seven tons per week, and that it was to conform to the Government specification. The Government agreed to finance the Company up to £15,000. After many delays the still was ready for trial before the end of December, 1915. This was the first time in this country, or in any country, that potatoes had been used for the production of acetone in a continuous still on a commercial scale. The management of any continuous still required considerable skill and experience. On December 22, 1915, when the first trial run was made, it appeared that the still had been incompetently or carelessly erected, for the joints leaked, and the result was that the trial was highly unsatisfactory. Plaintiffs examined the machinery in December and January. Two defects were discovered which required readjustment and alteration. This having been duly carried out on February 11, 1916, the delivery was completed. The defendants then tried to work the still, and it was quite clear that the work of the still did not meet with the approval of the Government. Prof. Hodgkinson, the Government's chemist, was not satisfied with the way in which the defendants were working the plant and still. In consequence, as his Lordship thought, of these adverse reports, the Government

decided to take over these works, and they took them over on March 14, 1916, and appointed Dr. Hore as manager. The still had been allowed to get into a dirty state with mud and sand from the mash, and in his Lordship's opinion it was impossible to get satisfactory results from the still in that condition. This condition accounted in large measure for the unsatisfactory results obtained. In May the Government decided to work the still with their own engineering staff and work with fermented maize. His Lordship had arrived at the conclusion that, for the purpose of testing the capacity of the still, there was no material difference between the defendants' potato ferment and the Government's maize ferment. By July this still passed into reasonably competent hands, and from the time Mr. Crow took charge on behalf of the Government, it appeared to have given, and was now giving, entire satisfaction to all concerned. He must attribute the bad results which the defendants obtained from this still to their own inexperience and not to defects in the still. The still was not in accordance with the warranty given as regards the dip pipes and the pre-heater. Except in these two respects no breach had been proved of the warranty that the still would deal with 50,000 gallons of potato mash in 24 hours.

He allowed the defendants the sum of £120 in respect of the two matters he had mentioned, and 40s. on their counter-claim for loss of profits through breach of the warranty. That amounted to £122, and defendants were entitled to reduce the price to that extent. He therefore gave judgment for plaintiffs for £953, and the general costs of the action, defendants to have the costs of the issues upon which they had succeeded. His Lordship granted a stay of execution on the usual terms.

MANUFACTURE OF METALLIC FILAMENTS. *British Thomson-Houston Co., Ltd.* v. *Duram, Ltd.*

On March 18, the House of Lords heard the appeal of the British Thomson-Houston Co. from an order of the Court of Appeal affirming a judgment of Mr. Justice Astbury in an action to restrain the Duram Co. from infringing two Letters Patent of which the appellants were the legal owners. The Letters Patent (Nos. 21513 of 1910 and 17722 of 1911) covered an invention for a process and apparatus for the treatment of metallic tungsten and for the manufacture of electric lamp filaments therefrom and for improvements in methods of wire drawing. The appellants said that at the date of the Letters Patent melted tungsten was unknown; it was only known as a powder, or in filament form as aggregates of an amorphous structure or of infinitesimal crystals. One method was set out in the specification whereby the tungsten aggregates could be put into condition for rolling, hammering and drawing, and it consisted in mixing finely-divided tungsten powder with tungsten oxide and glucose, forming the mixture into a rod, drying and heating it in a vacuum to expel carbon, and then subjecting the rod to prolonged heating near the melting point of the metal. The product was not melted tungsten but an aggregate of tungsten particles in a coherent form, and from it tungsten wire for incandescent lamps could readily be drawn. The vast majority of lamp filaments are now made by this method, which has superseded the older and more elaborate process of Just and Hanaman.

The Respondents alleged that the Letters Patent were involved on various grounds, but they relied mainly upon want of novelty and subject matter. They relied upon various prior documents, but mainly on certain papers of M. Henri Moissan, who in the year 1893 investigated the properties of tungsten with the electric furnace, and published his results. He described a process for preparing it and freeing it from carbon, and he stated that it was like iron, capable of being welded by hammering when heated to a temperature far below its fusing point; that it could be filed with facility and forged; and that when free from carbon it did not scratch glass. He also determined the specific gravity of the purified tungsten which he obtained. His work and conclusions were well known to the scientific world at and before the date of the patent.

The Lord Chancellor, in moving that the appeal of the British Thomson-Houston Co. be dismissed, said he was unable to read the words of claim 1, "the metal in a coherent form," as meaning tungsten which had been subjected to the appellants' preparatory process as described in the specifications. If that had been intended it would have been very easy to say so, and it appeared to him that the word "coherent" would not bear the strain which appellant's interpretation put upon it. The body of the specification referred to the fact that tungsten was ordinarily obtained in the form of a finely-divided dark powder, and went on to speak of its being "agglomerated into a coherent product" by special treatment. "Coherent" here denoted simply a compact mass as distinguished from powder. The specification spoke of a rod of tungsten having been obtained "by the methods above described or by any other method which yields a pure coherent product." He could not read those words as denoting the process described in the preceding lines: on the contrary they appeared to him to indicate that so long as a pure coherent product was obtained, any method whatever might be employed. It was no doubt open to the patentees to claim tungsten obtained by their preparatory process for use for one purpose only, just as it was open to them to claim it generally, and for all purposes. Any such special claim would, however, have been open to any objections which would lie against the claim for all purposes, and in view of the general claim originally made (claim 5) and its subsequent abandonment, one would expect clear words if it was intended to put forward any claim of that kind. In his opinion the words "in a coherent form" in claim 1 could not be read as denoting tungsten obtained by the appellants' preparatory process or its equivalent. It was upon this first point that appellants chiefly relied as showing subject matter. In his opinion it had failed and the first claim was on the fine construction, one for subjecting any form of the coherent metal to the influence of heat while it was being operated on or manipulated. The appellants, however, further asserted that the application of heat, especially of continuous heat, during the process of working showed invention, and was good subject matter for the patents. There could be no subject matter in the application to tungsten of the old process of working under heat, as that did not require any invention. The appellants asserted that they discovered that tungsten was peculiarly sensible to any lowering of temperature, and they pointed out that it was preferable to heat both rolls and tungsten while the rolling operation was going on, and there were no special precautions for the application of heat to tungsten for this purpose. The claim was merely for subjecting the metal to the action of heat while it was being worked, and the operator was left to find out by experience what were the necessary precautions. As on his (the Lord Chancellor's) construction of the first claim, the use of tungsten in the form produced by the preparatory operation was not claimed, it was unnecessary to consider whether the process so described was novel, and such as would have supported any patent based upon it.

Lords Atkinson and Shaw concurred. Lord Dunedin dissented.

The Appeal was dismissed with costs.

THE POST-WAR POSITION OF THE SULPHURIC ACID AND FERTILISER TRADES.

REPORT OF THE DEPARTMENTAL COMMITTEE ON SULPHURIC ACID AND FERTILISER TRADES, 1918. [Cd. 8994. 2d.]

The Committee was appointed in February, 1917, by the Minister of Munitions as a result of representations from the trades concerned.

To obtain a reliable estimate of probable post-war conditions, a careful survey has been made of the pre-war and present positions.

Before the war acid plants were almost entirely of the lead-chamber type, and the bulk of the acid was sold and used as weak chamber (or Glover tower) acid. There were only three firms using the contact process and strong acid was also produced in relatively small quantities by the concentration of chamber acid. The plants were seldom worked to their full capacity owing to the varying demands, and when the war made increased production necessary the manufacturers were able to increase the output by 10 per cent. without additional plant.

Under war conditions it was soon realised that there was grave danger of a shortage of acid for explosives manufacture. The enormous demand for high-strength acid was met by the more intensive working of chamber plants, by curtailing the supplies to other industries—the fertiliser makers were particularly hard hit—and by installing a number of concentration plants. Oleum was also imported from America on a large scale. When these measures did not meet the growing requirements it was decided to erect large oleum plants, and as a result of these increased productions the Committee forecast a probable post-war productive capacity 60 per cent. in excess of the pre-war demand. The disposal of this surplus is the great problem to be faced.

The lack of contact plants in this country has been quoted in some quarters as showing the unprogressive policy of our acid manufacturers, but the Committee thinks otherwise, as it finds that for the production of weak acid such as is required by the majority of home acid consumers, the chamber process is cheaper and more efficient.

About 60 per cent. of the pre-war production of acid was consumed by the two fertiliser industries sulphate of ammonia and superphosphate. Of these the former was steadily increasing with the introduction of by-product coking, but the superphosphate industry was in a very unsettled state for several years previous to the war. The trouble was largely caused by the competition of foreign manufacturers who often had the advantage of lower freights and cheap supplies of zinc blende acid.

The war has caused great changes in both the fertiliser industries; a large amount of ammonia has been converted into strong liquor and used as such for munitions manufacture, thus avoiding the use of sulphuric acid; whereas in the superphosphate trade output has been greatly reduced owing to lack of acid.

The development of the spelter industry since the outbreak of war, by introducing the roasting of zinc blende, adds further difficulties to the post-war position, by reason of the by-product gases which must be converted into acid, and it is expected that this by-product acid will amount to one-fifth of the anticipated surplus.

Against the surplus must be set the possible means of increasing the consumption. A number of the lesser industries may largely increase their demands, but the Committee believes that it will be some considerable time before, for instance, the dye industry will be able to absorb an appreciable amount of the surplus. The only real prospect of utilising the increased supplies of acid is in the expansion of the fertiliser industries.

In the case of the sulphate of ammonia production, the limiting factor is the quantity of coal carbonised in by-product plant, and although this is expected to increase steadily, the increase will hardly affect the immediate acid situation. It is, therefore, agreed that the immediate increase in acid consumption depends almost entirely on the expansion of the superphosphate industry.

Agricultural experts have been consulted, and, although their opinions differ as to the extent to which superphosphate can be used (*v.i.*), it is agreed that an enormous increase in the use of phosphatic manures is not only possible but essential for the national food production. Prof. Middleton gave the Committee a detailed estimate showing that if 3,600,000 acres of grass land were turned over to cereals, etc., the consumption of phosphate manures could be increased by 600,000 tons each of superphosphate and basic slag. The estimate gives a pre-war cultivation of :—

Land for cereal crops, etc. ..	13,100,000 acres.
Grass land	33,390,000 ,,

whereas the post-war distribution is assumed to be

Land for cereal crops, etc. ..	17,000,000 acres.
Grass land	29,700,000 ,,

Another estimate is given by Sir Charles Fielding, who shows that if 48 million acres of land are cultivated so as to produce the whole food supply of the United Kingdom, additional fertilisers are required to the following extent :—

Sulphate of ammonia (or nitrate of soda)	300,000 tons.
Superphosphate	900,000 ,,
Basic slag (for grass lands) ..	1,200,000 ,,
	2,400,000 ,,

As the supplies of basic slag do not reach the quantities mentioned, superphosphate may replace it in the above estimates, and the figures give some idea as to the possible extensions in the superphosphate trade.

Both as a measure to meet the sulphuric acid position and to improve our food production, the Committee recommend the Government to pursue a vigorous agricultural policy and to enforce the adequate use of fertilisers.

After taking into consideration all the possibilities of increasing the home consumption of acid, the Committee expects that for several years after the war there will still be a surplus plant capacity of at least 35 per cent of the pre-war output, and unless this surplus is substantially reduced it is certain to cause serious disturbance both in the acid market and in the markets of the many products which depend on acid manufacture.

The Committee finds itself compelled to recommend a system of scrapping a certain number of the most inefficient and badly-situated plants. A further number of plants must be shut down but kept in working order to meet the future demands of expanding trade. As the present situation has been created by the State's demand for acid, it is clearly incumbent on the State to compensate the owners of plant that is either scrapped or shut down, and it is recommended that such compensations be paid out of the public funds.

It is pointed out that when the Treasury is assessing for income tax, a much higher rate should be allowed for depreciation, and on acid plants this figure should be at least 10 per cent.; for concentration plants, owing to their shorter life, a still higher figure should be allowed.

The formation of a national association of sulphuric acid manufacturers is advocated, and it is pointed out that a large number of the questions discu sed in this report could be conveniently settled by such an association together with representatives of the Government Departments involved. It is further suggested that a joint committee of the Acid Association, the Fertilisers Manufacturers' Association, the Sulphate of Ammonia Association, and the Zinc Smelters' Association be convened to deal with the various difficulties in connection with zinc blende acid. Every effort should be made to link up the new roasting plants with existing efficient acid plants.

As regards markets, the dominant point is that zinc blende acid is a by-product which the smelter must dispose of, and it should be the best policy for the acid and fertiliser trades to negotiate for this by-product acid through their associations. Similar arrangements between the trades' associations have been carried out in the zinc industry both in Belgium and America.

The Committee has dealt in a general way with the question of manufacturing costs, and while recognising that this is a highly complex subject, it has drawn the following conclusions form careful comparisons of the various processes:—

(1) For high-strength acid, as required in the dye industry, the contact system is the cheapest and most efficient.

(2) For low-strength acid as required for fertilisers, the Grillo contact system and the ordinary chamber plant are about equal in cost of production, but for convenience and ease of working the chamber plant has the advantage.

(3) Mannheim plants have higher costs than Grillo plants, and could not compete with chamber plants in the production of weak acid.

(4) In considering costs, the important item of freight to the consuming works must be included.

(5) Low costs and efficient working are very essential when the acid plant is associated with superphosphate manufacture, as acid charges make up a large proportion of the total fertiliser cost.

(6) A scientific system of cost-keeping should be adopted in every works, and the methods and records of the Government factories should be published after the war.

In the concluding remarks the Committee states that "In view of the importance of scientific control of chemical operations we desire to draw attention to the need for improving the status of the technical chemist."

A. R. R.

APPOINTMENT OF PAPER CONTROLLER.

The supply and distribution of paper has now been placed under a Controller in lieu of the Royal Commission. The President of the Board of Trade has appointed Mr. H. A. Vernet to the new office. [Address: 23, Buckingham Gate, London, S.W.1.]

LABOUR RESETTLEMENT COMMITTEE.

The Minister of Labour has appointed a committee under the above title to advise him on problems concerning the demobilisation of the Forces and the discharge of workers owing to the cessation of work connected with the war. The Committee consists of: The Right Hon. the Minister of Labour (chairman), the Right Hon. Lord Burnham (vice-chairman), and sixteen representatives of employers. A representative of the Association of British Chemical Manufacturers is also to be appointed.

GOVERNMENT ORDERS AND NOTICES.

BISMUTH ORDER, 1918.

The Minister of Munitions has ordered (March 12) that Regulation 30A of the Defence of the Realm Regulations shall include the following classes of war material:—All bismuth-bearing ores and bismuth metal and alloys and salts derived or produced therefrom.

Particulars of stocks held and applications for permits should be made to the Controller of Non-Ferrous Materials Supply, Ministry of Munitions, 8, Northumberland Avenue, London, W.C.2.

Every owner, lessee or licensee of bismuth-bearing mines in the U.K. to furnish to the Controller particulars of monthly output and deliveries of bismuth ore, concentrates and stocks in hand at the end of each month.

Particulars of shipments afloat or parcels landed or in warehouse to be returned by merchants, importers and brokers.

Users of bismuth ore and manufacturers of goods containing bismuth to make monthly returns showing stock in hand, receipts and consumption of such ore, and stock in hand, output and deliveries of such goods.

Monthly returns of consumption and stocks are also required from users of the metal or its alloys. The first return to be made on April 1. No return, however, is required from persons holding not more than 56 lb. of salts or 14 lb. of metal or alloy and not using them for the manufacture of steel, alloy of steel or other metal.

[The full text of the Order is in the *London Gazette*, Mar. 12.]

Notice of General Permit under the above Order.—The Minister of Munitions gives notice that he hereby until further notice permits any person to purchase bismuth metal and bismuth salts not exceeding in any one calendar month in the case of bismuth metal a total quantity of 10 lb. and in the case of bismuth salts a total quantity of 56 lb., provided that the same are purchased and in fact used for pharmaceutical or medical purposes only, and further permits a sale to any person purchasing an hereinbefore authorised.

SHELLAC.

The Minister of Munitions, in exercise of the powers conferred upon him by the Defence of the Realm Regulations and all other powers thereunto enabling him, hereby orders as follows:—

1. Every person holding or having under his control, whether in stock or transit, any shellac as hereinafter defined, shall within seven days of the date hereof furnish a return to the Controller, Non-Ferrous Materials Supply M.S. L. at the address undermentioned, containing full particulars of such shellac, the respective grades thereof, the purposes for which the same is intended, and the average monthly consumption of shellac by such person for any purpose during the year 1917; provided that no such return is required from any person unless he has at some time since January 1, 1917, had in his possession or under his control an amount of shellac exceeding an aggregate of $7\frac{1}{2}$ cwt. net weight.

2. No person shall as from the date hereof until further notice purchase or, except for the purpose of carrying out a contract in writing existing prior to such date for the purchase of shellac, take delivery of any shellac whether situate in or outside the United Kingdom, except under and in accordance with the terms of a licence issued under the authority of the Minister of Munitions, or sell, or except for the purpose of carrying out a contract in writing for the sale of shellac existing at the

date thereof, deliver any such shellac to any person other than the holder of such a licence and in accordance with the terms thereof, provided that no such licence shall be required by any person for the purch se of shellac in quantities not exceeding an aggregate of 7½ cwt. net weight during any one calendar month or for the sale or delivery of such maximum quantity on any such purchase.

3. The expression "shellac" shall for the purpose of this Order mean:—Shellac, stick lac, seed lac, garnet lac, and button lac, or any of them.

4. This Order may be cited as "The Shellac Control Order, 1918."

5. All applications for licen es shall be addressed to:—The Controller, Non-Ferrous Materials Supply, M.S./L., Ministry of Munitions, 8, Northumberland Avenue, London, W.C.2.

March 12, 1918.

WORKMEN'S COMPENSATION ACT, 1906.

The Secretary of State for the Home Department hereby gives notice that on the 26th February, 1918, he made an Order under Section 8 (6) of the Workmen's Compensation Act, 1906, extending the provisions of the Act to (a) Poisoning by benzene and its homologues, or the sequelæ, and (b) Poisoning by dinitrophenol or its sequelæ; and consolidating the Orders of the 30th July, 1913, 1st July, 1914, 7th July, 1915, and 6th May, 1916, with amendment.

Copies of the Order, which is now in force, can be purchased through any bookseller, or directly from H.M. Stationery Office.

March 6, 1918.

Other Orders, etc.—Regulations for the year beginning March 1, 1918, regarding the importation, distribution, and priority of supply of paper, and paper-making materials.

Hemp (Restriction of Consumption) Order, 1918. Feb. 26.

Paper-Making Materials (Home Produced) Order, 1918. Mar. 13.

Sale of Wool (United Kingdom) Order, 1918. March 5.

Domestic Sheep Skins Order, 1918. Mar. 6.

Flax Yarns (Shipment from Ireland) Order, Amendment. Mar. 7.

Safety Lamps Order. March 9, 1918. (Coal Mines Act, 1911.)

Leather (Certificate) Order, 1918. Mar. 11.

EXPORTS.

The Director of the War Trade Department announces that the following categories of goods of which the export is prohibited may, if preentered during the period of validity of an export licence, be shipped after the licence has expired without further reference to the War Trade Department, subject to the discretion of the local Collector of H.M. Customs and Excise:—

(A) Aerated and mineral waters. (A) Casein, and preparations thereof. (A) Castings, malleable, hematite iron. (A) Cast iron pipes. (A) Cinematograph films. *(A) Coal, except coal allowed by the Commissioners of Customs and Excise to be shipped as bunker coal. (A) Coke and manufactured fuel. (A) Copper manufactures, the following:—All articles wholly or partly manufactured of copper or its alloys, except articles partly manufactured of copper or its alloys in which the total weight of copper and copper alloy does not exceed 5 per cent. of the total weight of the articles, and does not exceed 56 lb. (C) Electrical apparatus and plant for the generation, distribution and utilisation of electrical power not otherwise prohibited. (C) Fibres, vegetable:—Tissues and manufactures thereof not otherwise specifically prohibited. (A) Fireclay and articles wholly manufactured of fireclay, including firebricks. (A) Fuel economisers. (A) Grindstones. (A) Hair, animal, and tops, noils, mixtures, waste, and yarns thereof. (A) Jute wrappers (Surat tares) other than such wrappers as constitute the coverings of goods to be shipped for exportation and are allowed by the Commissioners of Customs and Excise to be shipped as such coverings. (B) Leather goods manufactured wholly or partly of leather, not otherwise prohibited. (A) Linoleum. (A) Moss, Carrageen. (C) Mosses, other than Carrageen moss. (B) Rubber, gutta-percha, or balata, goods manufactured wholly or partly of. (A) All threads, yarns and twists of tussah silk and artificial silk. (H) Tissues and fabrics of silk of all kinds (including artificial silk).

Soaps, the following:—(A) Soap, including soft soap. (B) Tin, manufactures of (except tin plates and receptacles made from tin plates and hollow ware).

The above concession will not, however, be allowed in respect of any exports to Norway, Sweden, Denmark and Holland.

Applications for the extension of all licences not covered by the foregoing concessions should be addressed to the War Trade Department, care being taken to explain why the licences were not utilised during the period of their validity.

* In the case of coal, coke and manufactured fuel, shipment will only be allowed without extension of the licence when loading actually commences within seven days after the expiration of the period of validity of the licence.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, March 7, 14, 1918.)

OPENINGS FOR BRITISH TRADE.

H.M. Commercial Attaché at Shanghai reports that there is a steady and growing demand in Shanghai for drugs, patent medicines, disinfectants, soaps, perfumery, paints and varnishes, syrups and essences for mineral water manufacture, etc.

The Department of Overseas Trade (Development and Intelligence) is informed of the prospective establishment of an import and export house in Spain, having offices in Madrid, Barcelona and Bilbao, with the object of developing Anglo-Spanish trade relations. The firm responsible for this venture desires to represent in Spain, as soon as possible after the war, United Kingdom manufacturers and exporters of general merchandise particularly raw materials (including coal and by-products, rubber, and mineral and vegetable oils), machinery (agricultural, textile and mining), and also tin and tin plates. A partner of the firm is in the United Kingdom. [Reference No. 57.]

An inquiry has also been received for names of manufacturers of paste powder required for box-making and other uses.

A Canadian company, manufacturing glacial acetic acid upon a large scale, would be glad to receive inquires from United Kingdom firms wishing to purchase supplies.

TARIFF CUSTOMS EXCISE.

Argentina.—Revised official valuations have been fixed for certain commodities for the purpose of assessing export duty thereon as from March 1. The list of goods affected includes: Dried and salted cattle hides, wheat flour, quebracho logs and extract, tallow and melted fat, dried blood, oilseed cake, linseed, margarine and palmitine.

Denmark.—The exportation of mica of all kinds and of tinned articles is prohibited.

Ecuador.—The exportation of sugar, fats, etc., is prohibited.

France.—The prohibition of the exportation of photographic materials has been amended in so far as the following goods may now be sent to all Allied or neutral countries, except Switzerland: Photographic plates, negatives, sizes 18/24 and below; plates, positive, of all sizes; plates, radiographic, of all sizes; plates for colour photography; citrate of silver papers of all sizes; and post cards and cards, of all sizes, sensitised with citrate or bromide of silver.

France and Algeria.—The French Customs Office in London has notified to the Board of Trade a decision of the French Ministry of Commerce, under which certain articles of foreign or Colonial origin, which have been subjected to working in this country, are to be regarded for the purpose of the French import prohibition regulations as of United Kingdom origin, so that import licences for such goods are now to be obtained by exporters in this country from the French Customs Office in London (Bank Buildings, Kingsway, W.C.2). The goods affected by the decision include reclaimed rubber, rubber waste and ivory waste. Doubtful cases should be referred to the French Customs Office in London.

Malta.—A list of revised import duties has been issued. Among the articles affected are: Malt, saccharine, methylated spirits, sugar, varnish containing spirit and vinegar. The table of exemptions includes charcoal, coal, coke and patent fuel, cement, indigo, soap, copper sulphate and sulphur powder for spraying, various metals, etc. A 5 per cent. *ad val.* duty is levied on acids and alkalis, drugs, oils, paints and colours, photographic materials, soap (except laundry), wax, indiarubber, chemicals (unless containing alcohol), etc.

New Hebrides.—The importation of explosives is prohibited.

Nigeria. Export duties have been imposed upon: ground nuts, 10s. per ton; hides and skins, tanned 3d. per lb., untanned or haired 2d. per lb.

In future the Government will accept from an exporter of tin-ore an undertaking in writing that the tin will be smelted in the U.K. or a British Possession, and a certificate that the tin has been landed in the U.K. or in a British Possession: provided that the exporter shall include in his contract of sale of the ore a clause to the effect that the buyer undertakes not to re-export the ore, or, if he should do so, to indemnify the original exporter from Nigeria against any claims for duty which may be made upon him by the Colonial Government, and that if the ore should be sold to a third party before being smelted a similar stipulation shall be made in the contract of sale. It will therefore be necessary for the exporters to send out to Nigeria not only a landing certificate, but also a certified copy of the contract of sale. The undertaking should be given in a form prescribed in these Regulations. The Regulations also contain the prescribed form of guarantee required to satisfy the Governor that the tin-ore exported will be smelted in the United Kingdom or in a British Possession.—(*Bd. of. Trade J., Feb.* 21 and 28.)

Norway.—The exportation of fish and fish products, of scientific instruments, including optical lenses, and of cellulose wadding, has been prohibited.

Southern Rhodesia. A supplementary list of Customs decisions relating to the importation of various materials, including chemicals, has been issued.

Trinidad and Tobago.—A revised Customs tariff is now in operation, involving preferential treatment of articles, etc., produced in any part of the British Empire.

Italy.—Maximum prices have been fixed for calcium cyanamide, copper sulphate, and mineral phosphates.

TRADE NOTES.

BRITISH.

Molybdenum and Tungsten in Canada.—The Canadian Government has decided to permit under licen e the free export of molybdenum and tungsten, their ores, concentrates, alloys and chemical salts, to approved consignees in the United States and France. This will relieve the situation that has been considered somewhat oppressive to Canadian producers. Since an embargo was placed on the export of these metals the market for the Canadian production has been confined very largely to purchases made on account of the British Government at fixed prices. These fixed prices have been lower, at times considerably lower, than the open market prices offered in the United States and France. The requirements of the British Government are being met and the Canadian producers will now be permitted to take full advantage of the open markets in the United States and France.—(*Iron Age, Jan.* 31, 1918.)

Chrome Ore in Quebec.—A large amount of chrome ore is being mined in Richmond county, Quebec, though it is of lower grade than that of the now exhausted mine at Thetford. Two concentrating plants owned by the Mutual Chemical Company, of Canada, have a daily capacity of 50 tons of concentrates. A new mill of 15 stamps has been erected by Joseph Belanger, of Black Lake. The price of chromite is now the highest on record, and has advanced considerably over 1916 values. Present quotations for ore f.o.b. Thetford, Blake Lake, or Coleraine, range from $21 for 25 per cent. sesquioxide to $64 for 50 per cent. (concentrates) per ton of 2,240 pounds and the demand exceeds the supply.

Electro-Metals in Canada.—Contracts to the Shawinigan Electro Metals Company from the British Government for production of chemicals have been extended to cover the year 1918. The Shawinigan Water and Power Company has extended its power plant at a cost of about $1,800,000. —(*Can. Chem. J., Feb.*, 1918.)

Australian Import Trade.—H.M. Trade Commissioner at Melbourne in reporting on the decline in the value of imports into Australia during the nine months ended September 30 last, states that the decline in drugs and chemicals from the United Kingdom was very marked, and that there was a remarkable increase in the Japanese imports under the heading of paints, colours and varnishes. —(*Bd. of Trade J., Mar.* 7, 1918.)

Chemicals in Madras.—Great Britain supplies the bulk of the chemicals imported, viz., disinfectants, potassium compounds, bicarbonate of soda, soda-ash, borax, alum, yellow prussiate of soda, bichromate of potash, oxalic acid. The United States and Japan have a share in the supply of aluminium sulphate, calcium carbide, and caustic soda. The values of chemicals imported into the Madras Presidency in 1916 and 1917 were about £108,000 and £158,000 respectively. Indigo exports: During the period April 1 to October 31, 1917, exports were as follows (in lb.): United States, 5488; United Kingdom, 65,408; Straits Settlements, 21,056; Australia, 1120; China, 8736; Japan, 23,520; Ceylon, 28; total, 125,356. —(*U.S. Com. Rep., Jan.* 14, 1918.)

BRITISH SOUTH AFRICA.

In 1913, British South Africa imported from Germany goods to the value of £3,300,000. Part of this trade has gone to neutral countries, but a good share to the United Kingdom. Switzerland has doubled its exports to South Africa, Sweden shows an increase, Japan's share is five-fold (£500,000, including glass-ware and superphosphates), while that of the U.S.A. is double. The

year under review (1916) has been prosperous, imports (£39,000,000) having increased 33 per cent and exports (£21,700,000), 42 per cent. The following table shows the origin of the principal imports of chemical interest :—

	Drugs and chemicals.	Glass and glassware.	Glycerin.	Indiarubber goods and gutta percha.	Unmanufactured leather.	Nitrates.	Mineral oils.	Vegetable oils.	Paints and colours.
	£	£	£	£	£	£	£	£	£
Total value	1,180,000	341,000	381,000	505,000	123,000	282,000	850,000	262,000	272,000
	%	%	%	%	%	%	%	%	%
U.K.	82·5	35	96	60	28	6	2·3	40	72
U.S.A.	7·2	25	0·5	30	31	—	73	2	15 5
Other countries	—	8·5 (Japan)	3·5 (Australia)	—	41 (Australia)	94 (Chile)	21 (Dutch E. Indies)	27·4 (British W. Africa)	—

Exports.—The exports included aloes, raw asbestos, wattle bark, blasting compounds, buchu leaves, copper ore, hides and skins, manures, soap, and tin ore and concentrates.

Mining.—The value of minerals produced in the Union was £51,000,000, an increase of 10 per cent. on the previous year. There was a record production of gold in the Transvaal (9,295,588 oz.). Copper amounted to 22,862 tons, and 3263 tons were produced in the Transvaal alone. Most of the tin is destined for the U.S.A., but is sent to Singapore to be smelted. Blue and white asbestos is also being produced, while talc has been discovered and is being exported to the U.K. and U.S.A. A factory is being erected for the conversion of earth pigments and ochres mined in the Cape into paints, distempers, etc., and an export trade may be developed. Experiments are also proceeding on the utilisation of Tambookie grass, which grows in large quantities in the Transvaal and makes a paper of satisfactory strength. It yields more pulp than Algerian esparto and can easily be bleached.

Rhodesia.—Mineral production is the chief source of the wealth of South Rhodesia, although agriculture on a scientific basis is advancing rapidly. In 1916, 930,356 oz. of gold were produced, 3521 tons of copper, 88,871 tons of chrome iron ore, 491,582 tons of coal, 6157 tons of asbestos, and 200,676 oz. of silver. The area of land under European cultivation was greatly increased, the chief crop being maize. Cattle dipping is becoming more usual, the number of dipping tanks having increased from 427 in 1914 to 761 in 1916. Imports included antifriction grease, blasting compounds, candles, mineral oil, perfumery, photographic supplies, rubber, soap, and zinc. Northern Rhodesia imported drugs and chemicals to the value of £2900. The principal non-mineral exports included raw indiarubber (£1420), cement (£6450), and common soap (£2100).—(*U.S. Com. Rep., Dec.* 6, 1917.)

WEST INDIES.

Cacao in the Dominican Republic.—The variety most frequently planted, known as "calabacillo," bears small yellow pods with flat beans; "forastero" and "criollo" are planted to a less extent. The bulk of the cocoa is grown and prepared for the market in a very primitive manner, and only recently has any attempt been made to introduce scientific methods. Facilities for agricultural instruction are badly needed. The seeds are planted direct in the fields, shade being provided by intervening crops of corn, yucca, bananas, and later amapola trees. Little or no use is as yet made of fertilisers. The yield from the 7th to the 25th year is 3½ to 4 lb. per tree on the most fertile lands with about 175 trees to the acre. Little attempt has been made to combat insect attacks. The cacao known on the market as "Sanchez" is mainly exported to New York. The average amount exported during the period 1912-1916 was about 20,000 tons per annum, and the value about £800,000, but in 1916 the value was considerably higher. Before the war, the U.S.A., Germany and France were the best customers; since 1914 nearly all the product has gone to the first-named.

Trinidad.—Exports of cacao were 23,970 tons, valued at about £1,600,000 in 1916, a decrease in weight of 171 tons and in value of £220,000 as compared with the previous year.

Tobago.—The production of cacao is increasing. In 1916 about 730 tons were produced as compared with 659 tons in 1915.

Portuguese Islands.—The annual production of cacao in São Thomé and Principe has increased from 30,200 tons in 1912 to 38,216 tons in 1916. In 1916 the bulk went to Lisbon, trade with Great Britain, Germany, Holland, and the United States being stagnant. The average production is about 250 lb. per acre, cheap labour being obtained by contract from the neighbouring mainland. Modern methods of preparing and handling the cacao, and means for combating sleeping sickness have been introduced.

Trinidad.—The war has been instrumental in deflecting the import trade from the United Kingdom to United States and Canada. In 1916, increases in exports of sugar, molasses and petroleum took place, and a marked development occurred in the petroleum industry. Thirty-four successful new borings were made, and altogether ten companies were engaged in the industry. Refining is carried on to a limited extent, petroleum, kerosene, lubricating and fuel oils of a very diversified character being obtained. Development is proceeding in the cultivation of cocoanuts, copra, cacao, rubber, limes, coffee and timber both here and in the neighbouring island of Tobago.

Bahamas.—A similar deflection from the United Kingdom, both in imports and exports, has occurred. Exports of sisal hemp, the leading industry, increased from 7,736,665 lb. in 1915 to 8,369,245 lb. in 1916. There is a prospect of legislative control over the exports of this commodity in the near future.—(*U.S. Com. Rep., Dec.* 29, 1917.)

FOREIGN.

Sweden.—H.M. Minister at Stockholm reports that the old nickel mines, "Klevfa Gruva," near Hvetlanda, are now worked by modern methods, and the present owners intend to cooperate with a Vesteras Company which was recently founded to produce nickel, cobalt, and electrolytic copper. The production of copper from the Falu mine is to be greatly increased, and a Bessemer converter is being erected for

refining. The Swedish match factories have formed a trust under the name of "Svenska Tandsticksaktiebolaget," with a capital of 45 million kroner (this J., 1908, 43R).

A "joint purchase" company has recently been formed by Swedish paper mills for making joint purchases on favourable terms. The company—"Svenska Papperbrukens Handels A/B"—is said to have been joined by 47 mills. A firm is reported to be planning the erection of a sulphite spirit factory at Fagervik, which will have an annual output of 3 million litres. A large company has been recently founded for the utilisation of waste fats; and five of the largest Swedish glass works have amalgamated into one company with a minimum capital of 3 million, and a maximum capital of 9 million kroner.—(*Bd. of Trade J., Mar.* 14, 1918.)

Crete.—The chief industry of Crete is that of oil production from olives grown in the island. The average quantity of olive oil exported in a year is about 8000 tons, exclusive of about 1000 tons of olive kernel oil. Soap is manufactured to the extent of about 2500 tons per annum, mostly by hand, and there is scope for the introduction of machinery. In addition to wine, there are a few factories producing other alcoholic beverages. About 100,000 kilos. of imported heavy hides and skins are tanned annually, and this industry has greatly developed of late. Chemical manures are used in considerable quantities. They were introduced in 1905, in 1912 the imports reached 780 tons, and now they are probably much greater. All the above figures are based on the Custom House statistics for 1912-1913; no statistics have been published by the local authorities since.—(*Bd. of Trade J., Mar.* 7, 1918.)

Cacao in Brazil.—Cacao occupies the third place in value in the scale of Brazilian exports. Estimating the present crop at 700,000 bags (of 132 lb.), or 41,300 tons, the average crop for the last three years amounts to 724,200 bags, or 42,712 tons. The average yield per tree is $1\frac{1}{2}$—$1\frac{3}{4}$ lb., but a much higher yield could be obtained with proper management. The fact that Brazilian cocoa has not commanded a better price in European and American markets is perhaps due to the fact that the plantations are divided among no less than 12,000 different estates, most of which are small and lack facilities for proper drying, hence giving rise to a poor product. The chief cacao-growing centres are the districts of Cannavieras, Belmonte, Ilhéos and Rio de Contas. —(*Bd. of Trade J., Mar.* 7, 1918.)

German Margarine Syndicate.—The Articles of Association of the newly-formed Verband der Margarine-und Speisefettwerke G.m.b.H. are published in the "Halbmonatschrift." They provide for the division of the German margarine industry into four groups:—Leipsig Association, Cologne Association, Van den Bergh group, and Jurgens and Prinzen group. Unaffiliated firms manufacture only from 2—5 per cent. of the total production. As the several groups had previously pooled both the output and the sale of the factories controlled by them, the way had already been opened for the combine, and the new association will probably survive the war. The factories received $1\frac{1}{2}$ times as much raw material in October as in September last.—(*Chem. Umschau, No.* 12, 1917.)

The Ministry of Reconstruction has issued a list of Commissions and Committees appointed to deal with questions which will arise at the end of the war. The list is revised to December 8, 1917, and the price is 4d.—(*Cd.* 8916.)

COMPANY NEWS.

BORAX CONSOLIDATED, LTD.

The report for the year ended September 30 last shows a trading profit of £374,300, as against £428,000, and a net profit of £385,527 as compared with £569,906 in the preceding year. The apparent decline is mainly due to the fact that the profits shown this year are arrived at after allowing for excess profits duty, which was not deducted from profits in the previous year. The directors report that business as a whole has held up well, although difficulty in obtaining freightage has affected the export trade. The dividends distributed, including 15 per cent. on the deferred ordinary shares, remain unchanged; and £46,267 is placed to depreciation and reserves, as against £62,321 a year ago. There are increases of £277,900 in the sundry creditors and credit balances item, which includes reserves for excess profits duty, and of £195,300 in stocks, which are valued at or under cost. £92,700 is carried forward as against £106,800 a year ago.

Addressing the 20th ordinary general meeting at the Cannon Street Hotel on March 22, the Right Hon. the Earl of Chichester, chairman of the company, explained that the net profit in the past year was about £42,000 more than for the year ending September 1914. The increase shown in the balance-sheet for buildings and plant was largely due to the outlay for construction of plant for the production of potash, as well as of borax, from the brine of Searles Lake, California, where the company is co-operating with the Solvay Company of America. Although progress in this enterprise has been much retarded through the delay in the delivery of machinery and the necessity for working out experimental details, potash is being produced in increasing quantities, and the investment is looked upon as hopeful. The increased demand for the company's products referred to last year has ceased; trade with Russia has finished for the time being, and the enormous freight demanded for shipments, both outward and homeward, has much retarded business. It is a matter for regret that the Government, which has asked manufacturers to keep up their export trade to the highest possible pitch, should have demanded exorbitantly high freights for Government-controlled ships. Regarding the current year, there was every hope that the net results would not compare unfavourably with those of the year under review.

PUBLICATIONS RECEIVED.

MODERN COKING PRACTICE. *By* J. E. CHRISTOPHER *and* T. H. BYROM. *Second Edition. Vol. I. Raw Materials and Coke. Vol. II. By-Products. Pp.* 110 and 120. (*London: Crosby Lockwood and Son.*) 7*s.* 6*d. per volume.*

EVERYMAN'S CHEMISTRY. *By* ELLWOOD HENDRICK. *Pp.* 374. (*New York and London: Harper Bros.*) 8*s.* 6*d.*

LIQUID FUELS FOR INTERNAL COMBUSTION ENGINES. *By* HAROLD MOORE. *Pp.* 200. (*London: Crosby Lockwood and Son.*) 12*s.* 6*d.*

BOLETIN DEL CUERPO DE INGENIEROS DE MINAS DEL PERU, NO. 83, ESTADISTICA MINERA EN 1915. *By* CARLOS JIMENEZ, *Ministeris de Formento. Pp.* 173. (*Lima*, 1917.)

ZINC ORES. (*Imperial Institute Monographs on Mineral Resources with special reference to those of the British Empire.*) *Pp.* 64. (*H.M. Stationery Office, Imperial House, Kingsway, W.C.2.*) 2*s. post free.*

REVIEW.

LIQUID FUELS FOR INTERNAL COMBUSTION ENGINES. *By* HAROLD MOORE, M.Sc. Tech. *Pp.* xv. + 200. (*London: Crosby Lockwood and Son.*) *Price:* 12*s.* 6*d. net.*

The development of the internal combustion engine working on liquid fuels has been a marked feature of engineering progress during recent years, but, as the author points out in his preface, the scientific study of fuels for these engines is still incomplete. Other factors than those associated with the use of liquid fuel for steam raising and heating purposes naturally have to be considered. Owing to his connection with one of the largest firms of internal combustion engine makers, Mr. Moore has had exceptional opportunity for the examination of liquid fuels and the observance of their behaviour in practice.

The work is divided into three parts. Part I. deals more or less generally with the materials which furnish and constitute fuels for internal combustion engines—petroleum, shale oils, tars, animal and vegetable oils, and alcohol. Part II., comprising three chapters, deals with fuels for engines fitted with carburetters, with vaporisers, and with atomisers, the latter including the true Diesel engines and the so-called semi-Diesel engines with hot bulb or similar ignition arrangement. Part III., which, with a useful appendix of various data, comprises nearly one half the book, is concerned with the examination of liquid fuels, and will prove of considerable assistance to chemists engaged in this work.

Petroleum products vary considerably in their suitability for use in Diesel engines, largely according to whether they are constituted on a paraffin base (Pennsylvanian and Ohio oils), or an asphaltic base (Californian and Mexican oils). Asphaltum oils are more viscous and so retain ash and water in suspension; their higher viscosity also is against efficient atomisation, thus causing slower burning, with formation of coke and smoky exhaust; the lower proportion of hydrogen also tends to give rise to smoke. Asphaltic oils are generally higher in sulphur content, but the author considers that the corrosive action of sulphur has been greatly exaggerated, parts maintained above condensation temperature being seldom affected.

Particular interest naturally centres around fuels which can substitute petroleum derivatives, the tars and tar oils. Raw tars present difficulties in use, the principal one arising from free carbon, particles of which are not completely consumed during the working stroke. Vertical retort tars which are low in carbon have been successfully used. The tar oils (obtained from the creosote and anthracene fractions) are generally suitable for Diesel engines, the main difficulty in their use being their high temperature of ignition. The author enumerates the main methods of overcoming this difficulty as:—Heating the oil, the injection air and suction air; mixing with a proportion of petroleum oil; using a separate jet of petroleum ignition oil; and injection of a small tar oil charge prior to the main charge. An important point noted by the author is that on adding many kinds of petroleum residuum to tar oil a sticky mass is precipitated, which completely excludes such mixtures from use.

In connexion with alcohol as a fuel, Mr. Moore states that with the use of an ignition oil, alcohol has given higher thermal efficiencies in a Diesel engine than any other fuel tested, but he concludes there is little possibility of its being applied in this way, firstly, because of expense, and secondly, because it can be successfully employed in vapour engines of much lower first cost.

The temperature of spontaneous ignition of oils is one of the fundamental physical properties governing their application for power production in internal combustion engines, and Mr. Moore's work in this connection is well known through his recent contribution to the Journal (1917, 109). The methods of Holm, Constam and Schläpfer, and the author are referred to at length. Mr. Moore considers that it would be advisable to adopt ignition temperatures in oxygen as standard as they are more reliable and the determination is cleaner and more convenient. In view of the wide deviation in the ignition points in air and oxygen shown in his own determinations this is questionable, for example, whilst turpentine has the same ignition point in each gas, the ignition temperature in air was higher than that in oxygen by the following averages:—Shale oil, 75°; petrols, 120°; lubricating oils, 137°; crude and residue petroleums, 148°; low temperature tar, 200° C.

An interesting point was noticed by the author in connexion with the viscosity of oils and their thermal efficiency, the latter being dependent on the former, due to the more perfect atomisation of the more fluid oils. He concludes that in Diesel engines the thermal efficiency is constant for fuels of various calorific power provided that their viscosity does not vary widely.

In practice the "net" calorific value of oils is frequently required, and this necessitates the troublesome and lengthy determination of their hydrogen content. Mr. Moore notes the useful relationship that for heavy coal tar products and paraffin oils the difference between the net and gross calorific values can be obtained with a sufficient degree of accuracy from curves plotted against specific gravity. Curves are given for the two classes of oil, and for ten points on the coal tar product curve the results are remarkably concordant.

Whilst perhaps the arrangement of the first two parts of the book might have been improved, and in one or two chapters profitably extended, it will be seen that the author has produced a very practical book and one which will prove of considerable service to engineers and chemists.

J. S. S. BRAME.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

Following a request made by the Council of the Association of British Chemical Manufacturers, it has been agreed that the Association shall use the Journal as its official organ. This arrangement, while it obviates the need for the issue of a new chemical periodical, will also promote the interests of chemical industries by thus linking together the two important organisations associated therewith.

ANNUAL GENERAL MEETING.

In accordance with the provisions of By-law 64, notice is hereby given that the Annual General Meeting will be held in the University Buildings, Bristol, on Wednesday, July 17, 1918, at 10.30 a.m. A programme of the proceedings will be issued later. Under Regulation 5 all elections to the Committees and all elections of Officers of Local Sections, with the exception of those to fill up unforeseen vacancies, must take place so that they can be reported to the Council in time to be considered at the meeting held under By-law 24 not less than two months prior to the Annual General Meeting (*i.e.*, April 19).

SULPHURIC ACID AFTER THE WAR.

If the projected National Sulphuric Acid Association is to fulfil the hopes of the Departmental Committee and others who favour its formation, it must be in a position to formulate a definite and equitable scheme for solving the serious problems connected with the restriction of the production of acid after the war, with particular reference to the position of individual firms. From the national point of view, it seems imperative that obsolete and inefficient works should be scrapped, and, from the standpoint of equity, that State factories which were erected for war purposes with public funds should not be allowed to remain in competition with the established trade. This means, of course, that compensation will have to be provided, and the National Association will be expected to devise a satisfactory scheme. Unfortunately, however, there are no indications as to how the Association intends to proceed in this direction. Representatives of gas works, and of the fertiliser and acid industries are asked to formulate a common policy, but by virtue of their widely diverse interests they cannot fail to have very different outlooks: different districts present different aspects of the problem, and even varying local conditions have an important bearing on the production of sulphuric acid.

That questions exist upon which agreement could be reached is undoubted, among which may be reckoned the question of heavy writing down and depreciation allowances. But on other questions, such as standardisation of output, allocation of material, constitution and functions of the Executive, power of majorities and safeguards of minorities, disclosure of cost (*i.e.*, proof of efficiency or the contrary), there will be so great differences of opinion that it seems difficult or even Utopian to expect the completion of a general arrangement. Furthermore, it is important to know what will be the position of existing works which do not join the Association, and what will be the status of new works which will probably come into existence after the war. How is the compensation for scrapped or closed-down plant to be allocated and paid for, and who will undertake the administration of the requisite funds?

If the National Association is to have a fair chance of success, it is felt that such questions as these should be frankly dealt with first.

THE CHEMICAL WORK OF THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.

GILBERT T. MORGAN.

When his late Majesty, King Edward the VIIth, laid the foundation stone of the new Royal College of Science for Ireland in 1904, he stated in his inaugural speech that the projected edifice was designed for a two-fold object—"instruction and research." It is the purpose of this essay to indicate how these two aims of scientific education have been pursued by those responsible for the policy of the institution which renewed its youth in the larger building in 1911.

Unlike its London analogue, the Irish Royal College remains under the direct control of a branch of the Civil Service, namely, the Department of Agriculture and Technical Instruction for Ireland. This administrative body, designated more concisely and familiarly on the other side of the Irish Channel as "The Department," came into being in the opening years of the present century, and has since associated itself consistently with the development of chemical teaching in the country, and especially with the application of chemistry to industry. The first-fruits of this policy were plainly shown in the Cork Exhibition of 1902, where in addition to comprehensive exhibits of agricultural implements and produce, were to be seen several collections relating to applied chemistry, and notably one illustrating the typical building stones and other constructive materials of Ireland.

The Royal College of Science in Dublin is regarded by the Department as the culminating step in its system of science teaching carried on in the Secondary and Technical Schools of Ireland. One of the first tasks of the newly-formed Department sixteen years ago, was to fill the ranks of suitably qualified teachers for developing this side of higher education. Two systems of training have been in vogue up to the present comparable with the two modes which formerly prevailed in Great Britain for enrolling soldiers in the Army.

On the one hand there is the "regular" system of giving the teacher in training a three, and latterly a four years' continuous course in science at the central institution in Dublin. But this preferable method was, at first, available only in comparatively exceptional circumstances. Very few students were in a position to avail themselves of the special advantages of such a training. Accordingly, at the outset, this method would not have sufficed to meet, within a reasonable time, the rapidly increasing demand for science teachers. Another procedure was, therefore, adopted, comparable with the "Militia" system of the old Army. Promising teachers were invited to come to the Dublin College during a month of the long vacation in order to take an intensive short course of chemistry, or some other branch of experimental science, and similar courses were instituted in various arts and crafts. The facilities offered by the Department in these summer courses have always been highly appreciated by the teachers of Ireland, some of whom have attended regularly for many years in succession. In this way a satisfactory solution was attained of the urgent problem of supplying teachers for the new programmes of practical instruction in science, inaugurated by the Department.

The "regular" teacher in training now qualifies in engineering, applied chemistry or agriculture, or in composite courses of experimental or natural science after four years' continuous study in the Royal College of Science for Ireland. This very com

prehensive and thorough training received at the hands of highly-qualified experts in each particular subject gives him a far more intimate and practical grasp of his subject than could possibly be acquired by the most diligent "militia-man" of science who, after an attendance at six summer courses, has only had the benefit of about 21 weeks of this intensive study. Nevertheless, the latter has one great advantage to his credit. Throughout this period he has been engaged in instruction whereas the A.R.C.Sc.I. has usually, on leaving college, to begin his teaching career. The competition between the two sections for academic posts is, however, likely rather to diminish than increase in the future. Even before the war the Associates in applied chemistry were in increasing numbers taking up industrial positions chiefly in Great Britain, but also in other parts of the British Empire. The war period has strengthened this tendency, and many graduates of the Royal College are engaged as chemists in the fighting services, in explosives works, and in dye factories.

In a recent lecture delivered to the Royal Dublin Society, on February 8, Mr. Fletcher, Assistant Secretary to the Department of Agriculture and Technical Instruction, opens up a prospect for the utilisation of the technical experience of these workers in Irish industries after the war. For these developments, which are possible, and, in the lecturer's view, inevitable, scientific skill and business organisation are essential. The scientific workers and investigators required to direct these national activities will be forthcoming only if technical education is developed to the utmost.

As a further aid to the acquirement of technical qualifications the Department has within the last four years introduced a new feature into the summer courses in science. Formerly these courses were of a generalised scholastic type inasmuch as they were devised to equip the teacher in training with certain fundamental qualifications which he had not previously had any chance of acquiring. Accordingly, the courses were arranged to cover a year of the Department's programme for day Secondary Schools, and admission to these courses was restricted to teachers in Secondary Schools in which the Department's programme had been adopted. The following table summarises the work in chemistry and indicates the number of teacher-students attending in this subject since the opening of the new College. It will be noticed that the last of the most elementary courses was held in 1915, and it is not intended to renew this class. The teachers in training are now expected to possess this amount of knowledge of experimental science.

science, holding a University degree or equivalent qualifications. In this and the succeeding year courses in chemical manufacture were undertaken by the late Dr. J. H. Pollok, formerly Lecturer in Metallurgical and Physical Chemistry at the Royal College of Science for Ireland. These courses embraced the following branches of applied inorganic chemistry: The sulphuric acid industry, phosphatic manures, bleaching powder and chlorates; the commercial applications of silica and silicates in the production of glass, glazes, bricks, earthenware and porcelain; the fixation of atmospheric nitrogen, and the metallurgy of iron and the commoner non-ferrous metals. Commercial inorganic analyses appropriate to these subjects were carried out in the laboratory.

The subject selected in 1916 was "Water for Industrial Purposes," and was carried through by Professor W. Adeney, whose expert knowledge of this important section of chemical technology is well known to British chemists. The course dealt with various natural waters, their suitability for industrial purposes and their bearing on public health. The relation between the constituents of natural water and the geological formation from which they are derived: the biochemical purification of dissolved organic impurities in water: the purification of trade waste liquors and effluents: the practical examination of natural waters by chemical and microscopic analyses.

In July of 1917 a course in "Wool Dyes and Dyeing," was organised by the writer. This class was attended by ten qualified student-teachers from various parts of Ireland, who supplemented the instruction received in eighteen lectures by laboratory work on the dyeing of wool with natural and synthetic colouring matters, the use of mordants, the application of the indigo vat in wool dyeing, and the production of developed and ingrain dyes. Each teacher in training also made preparations of synthetic dyes graded in difficulty to suit his previous experience of organic chemistry. Synthetic colours for dyeing experiments were generously supplied by the British Alizarin Company of London, and Messrs. Claus, Ltd., and Messrs. Levinstein, Ltd., of Manchester.

The numbers attending these courses in applied chemistry are given in the following table:—

Course in Chemical Manufactures 1914, 15 students attended.

Course in Chemical Manufactures 1915, 8 students attended.

Course in Water for Industrial Purposes 1916, 10 students attended.

Course in Wool Dyes and Dyeing 1917, 10 students attended.

These special courses by no means exhaust the

Total Number of Teacher-Students who attended the Summer Courses of Instruction in Chemistry since the opening of the new College.

Year.	Second Year Syllabus of the Preliminary Course of Experimental Science.	Special Course in Chemistry (3rd Year Syllabus.)	Special Course in Chemistry (4th Year Syllabus).	Special Course in Chemistry (4th Year Syllabus Repeat Section)	Total.
1912	(No class)	32 (2 repeating the Course)	18	17	67
1913	40	23 (3 repeating the Course)	18	16	97
1914	(No class)	16	23	(No class) 12	51
1915	36	26 (6 repeating the Course)	16	14	92
1916	(No class)	24 (1 repeating the Course)	20	9	53
1917	(No class)	32 (1 repeating the Course)	23	9	64
	76	153	118	77	424

In 1914 a new departure was made by instituting courses in applied chemistry intended mainly for teachers in technical schools. Applicants for admission are expected to be qualified teachers of

list of the Department's activities in applied chemistry. Instruction and research in this branch of science proceed continuously throughout the Session. During the last five years the follow-

ing problems have been investigated in the chemical laboratories of the Royal College of Science for Ireland :—The extraction of disinfectants and germicides from peat tar ; the production of glass from Irish materials ; the utilisation of nitre-cake ; the extraction of potash from Irish mica ; and improvements in the technique of water analysis.

In addition to these investigations the Department maintains a highly-qualified staff of analysts and other experts who undertake the examination of samples submitted in connexion with the agricultural and technical branches of the Department's work.

ENEMY METHODS OF GAS WARFARE.

In April 1915, a German deserter in the Ypres salient gave warning of the first attempt to use poison gas in modern warfare. No one believed him ; but a week later the enemy launched his first attack with chlorine gas against our unprepared and unprotected troops, and claimed subsequently to have killed 6000 men and to have taken an equal number of prisoners. Since that time gas warfare has become a combination of a science and an art, and its development shows the usual struggle between attack and defence, and in this case between poison and antidote.

The first method used took the form of a gas cloud. The cylinder was covered with a layer of moss containing potassium carbonate solution, and surrounded by sand bags. When the attack was made the protective covers were removed, and the cylinder connected with a lead pipe bent over the top of the trench. The success of such an attack depends largely on physical conditions. The wind direction must lie between two straight lines which make angles of 40° with the neighbouring sections of the front, and its velocity must be within the limits of 4 and 12 miles an hour. An upward current is the worst foe of gas, and the ground should slope gently away from the point of emission. Above all, the element of surprise plays a very important rôle. The gas used must be easily compressible, easily made on the large scale, of high density and toxicity, and preferably of low chemical activity. Thus the choice is practically limited to two gases, chlorine and phosgene.

Chlorine suffers from the defect of being too chemically active and therefore too easily absorbed. The first protection against it consisted of pads of cotton wool soaked in solutions of sodium thiosulphate and carbonate. The type changed every week, till finally a helmet was introduced, consisting of a flannel bag soaked in the above reagents and containing a mica window. This proved an efficient protection.

Phosgene was first used in December 1915 by the Germans but, thanks to our Intelligence Department, the danger was foreseen and provided against by the issue of helmets containing sodium phenate. These gave adequate protection when the gas concentration did not exceed 1 : 10,000, but as the enemy was soon able to increase the concentration a more efficient absorbent had to be found. The Russian suggestion of using hexamethylenetetramine, $(CH_2)_6N_4$, was adopted. In conjunction with sodium phenate, it gave protection against gas concentrations of 1 : 1000 for a considerable time. The type of respirator was changed to the box type, which strikes a useful balance between the efficiency of a larger apparatus and the lightness and convenience so essential in a gas mask. Thus an oxygen apparatus would be useless on account of its weight and short life. "The side that can first force the other to use oxygen respirators for protection has probably won the war."

Besides the antidotes already mentioned, activated charcoal, another Russian suggestion, is much used. Charcoal and alkaline permanganate will protect against nearly every gas, even up to concentrations of 10 per cent. for short periods.

The German apparatus, which is not so efficient as ours, consists of a small drum attached to the face piece of the respirator and containing three layers of materials, *viz.*, pumice soaked in hexamethylenetetramine, charcoal, and on the outside baked earth soaked in potassium carbonate solution and coated with charcoal.

In all probability, the method of attack by gas cloud has had its day, everything pointing to the gas shell as being the more deadly weapon and the more capable of development. The term "gas shell" is somewhat misleading, as the contents are generally liquid or solid, but the materials used are vaporised or atomised by the explosion, a proper adjustment between bursting charge and poison being necessary. The chief advantages of a gas shell are : it is not dependent on the wind, it can be fired with all the accuracy of modern gunfire, and it does not require a special corps for its application. On the other hand, a shell does not produce more than about 6 lb. of gas, whereas a German cylinder contains 40 lb.

The first type to be used was the tear shell, the "lachrymator" being pure xylyl or benzyl bromide. The bromination had apparently been carelessly performed, about 20 per cent. of the inactive dibromide being present. These shells "neutralised" units temporarily, instead of putting them out of action, but before long the highly poisonous trichloromethyl-chloroformate, $ClCOOCCl_3$, came into use. This has no action on the eyes, and hence is difficult to detect.

The next stage was the introduction of a substance which simultaneously harassed and injured the enemy. The most important of these is the dreaded "mustard gas" (dichloro-diethylsulphide, $(CH_2ClCH_2)_2S$, which has no immediate effect upon the eyes beyond a slight irritation, but produces extremely painful after-effects : the eyes swell and blister, the nose discharges freely, and coughing and vomiting occur. Direct contact with the skin also produces blistering, and the concentrated vapour penetrates clothing. The Germans scored heavily with the use of this shell until our counter-measures proved effective.

Other surprises of the enemy were phenylcarbylamine chloride, a "lachrymator," and diphenyl-chloroarsine, a "sneezing gas," which makes the victim sneeze so violently that he is prevented from using his respirator. A modern gas bombardment would consist of a carefully adjusted mixture of these types.

In addition to the substances already mentioned, the following have also been used :—

In shells : Allyl iso-thiocyanate, bromated methyl-ethyl-ketone, dibromo-ketone, nitro-trichloro-methane (chloropicrin), dichloro-methyl-ether, sulphur trioxide.

In hand grenades : bromoacetone, bromine, chloro-acetone, chloro-sulphonic acid, dimethyl sulphate, methyl-chloro-sulphonate.

Prussic acid has not been used by the enemy, being rated apparently below phosgene.

"Both sides are busy trying to find something that the others have not used, and both are trying to find a 'colourless, odourless, and invisible' gas that is highly poisonous. It is within the realm of possibilities that the war will be finished, literally, in the chemical laboratory."—(*S. J. M. Auld* (*of the British Military Mission*). *J. Wash. Acad. Sci.*, 1918, 8, 45-58.)

LA SOCIÉTÉ DE CHIMIE INDUSTRIELLE.

The inaugural meeting of the above society was held on March 16, 1918, at the Hotel Continental, Paris. M. Clementel, the Minister of Commerce, presided, and he was supported by Prof. Haller, Prof. Le Chatelier, M. Kestner (President), M. Masse and Prof. Matignon (Editor of *Chimie et Industrie*, the organ of the Society).

The attendance numbered nearly 600, and included representatives of scientific and industrial interests, and chemists belonging to the British and American Military Missions. The Minister welcomed the presence of the latter, and asked that they should consider themselves members of the Society during their stay in France.

The President, M. Kestner, thanked the Minister, and proceeded to explain the projected activities of the Society, and the work already accomplished, of which they were justly proud. From now onwards, he said, we must organise in order that our chemical industry may successfully oppose that of Germany after the war. Methods must be transformed and adapted to meet new demands.

Unlike Germany and the other great nations, France had no single organisation which could ensure the permanent co-ordination of all the factors operating in her chemical industries; it possessed merely certain special groupings, and a society for pure chemistry. The "Société de Chimie Industrielle" is intended to fill this gap. It has both technical and economic aims, and its device is "Militer et Servir"—"Combat and Serve." Combat against routine and inactivity. Serve the nation's interests.

To fulfil these objects, the Society proposes to create a technical centre, a library, an information bureau, and to publish a review, *Chimie et Industrie*, of general scope (th s J., 1918, 5 R.)

The Society wishes to create sections or centres, not only in the provinces, but abroad. Centres already exist in New York, Athens, and Santiago. Co-ordination of activities must be supplemented by an adequate dissemination of news concerning them. The programme of work undertaken, including the erection of a large central building, necessitates large funds which cannot be covered by members' subscriptions. Finally, in the interests of pure and applied science, it is much to be desired that the projected "Federation of French Chemical Societies" should materialise. It cannot be too strongly urged that if specialisation is essential to progress, isolation and individualism involve waste of energy and capital.

M. Clementel said that in performing the agreeable task of inaugurating meetings of the Society, he had the additional pleasure of bringing to them the encouragement of the Government in the work which they had undertaken. He then referred to the greater strength to be obtained by co-ordination, and to the economic struggle for chemical and industrial independence, and the influence these would exert upon the development and future expansion of France. The weakness of their chemical industry, its comparative lack of progress, was due to want of combination, but this pre-war inferiority had already been largely made good. Victims of prejudice, scientists were apt to regard factories as centres of commercial interest, contact with which was harmful to their reputation, and to the disinterestedness of science. Manufacturers, on their side, actuated by a false conception of their own perspicacity, regarded the intervention of scientific experts as expensive and likely to revolutionise their settled methods of work. By thus adopting the line of least resistance the door was left open to the enemy.

Referring to documents which had just reached him concerning German organisation after the war the Minister emphasised the vast projects of the enemy in regard to their chemical industries, in particular to the manufacture of dyes. "We must look ahead, abandon old formulas, and above all surrender our individualism. Such is the purpose of the 'Société de Chimie Industrielle,' which is deflecting activities into more modern channels, reuniting considerable capital, and creating a new centre of action. Neither the State nor the Minister of Commerce will fail to accord the new Society the full measure of their support."

M. Masse, President of the Syndicat de l'Industrie du Gaz, and of the Conseil d'Administration de la Compagnie Nationale des Matières Colorantes, then read a most interesting and forceful paper on economic organisation and industrial production. Recent events reveal how humanity has erred in believing itself rich, and in subscribing to the doctrine of "economic internationalism." A country must be able not only to supply its own essential needs, but also to export, thus establishing a credit account everywhere, and a debit account nowhere; therefore it must work and produce.

A priori theories are useless; the experimental method, by which the scientist induces from facts certain generalisations which are subject to modification with varying circumstances, alone can lead to results. The examination of the conditions of equilibrium between production and consumption, and the analysis of economic effort lead to the conclusion that what is required is neither classic individualism nor absolute collectivism.

German progress is largely due to the fact that their organisation of production has been national. Germany has abandoned individual competition, and has applied the scientific method and developed technical education. The Government has intervened to protect and increase German wealth, internally through legislation and public works, as well as externally through tariffs and the mercantile marine.

The following are the fundamental conditions, the realisation of which is essential for future prosperity: (1) Closest collaboration between science and industry; (2) respect for and organisation of individual liberty and property; (3) development of technical education, of plant and of means of transport and exchange; (4) voluntary association for promoting production (union of capitalists and federation of workers); (5) ever-increasing concentration of productive forces; (6) persistent action by public authorities to develop private initiative, and to direct it to public ends.

In the course of a communication on the subject of the patents possessed by the Badische Anilin und Soda Fabrik for the production of synthetic ammonia, M. Matignon reported that he had discovered several French patents ante-dating the German ones, which would allow the Allies to use the same industrial reaction independently, and thus annul the world monopoly which the Badische Company thought it possessed.

This discovery would lead to very far-reaching economic consequences, on account of the large capital which will be involved when the industry is introduced into all civilised countries.

After giving a résumé of the work of Perman, Haber, and of Haber and Le Rossignol (the latter an Englishman, who was apparently the first to foresee the possibility of realising the synthesis on an industrial scale), M. Matignon stated that he had discovered a patent taken out in 1865 by Charles Tellier, another by Tessie du Motay in 1871, and two more by Tellier in 1881, all of which antedated the German patents. There were also the patents of Ramsay and Young (1884), Halvati (1895), La Christiania Minekompani (1896), Le Chatelier (1901), and the published work of

Perman, who, in addition to working out the general conditions of the reversibility of the reaction between nitrogen and hydrogen, also studied the effects of the presence of metals upon it. All these patents demonstrate clearly that the synthesis of ammonia and the use of appropriate catalysts were well known and clearly indicated before the work of Haber and the Badische Company. "What is the legal value of the German patents under these conditions? It must be left for specialists to determine. The least one can say is that the validity of the German patents can now be disputed."

Before the meeting terminated, Prof. Haller drew attention to the connexion between the facts disclosed by M. Matignon and the work of a Frenchman, M. Kuhlmann, Professor at Lille, who, about the year 1835, suggested the method of making nitric acid, now known as the Ostwald process.

THE ORGANISATION OF CHEMICAL RESEARCH IN INDIA.

In an address delivered by Sir Thomas Holland, President of the Indian Munitions Board, at Lahore, on January 8, the question of the organisation of chemical research in India was discussed with special reference to the utilisation of that country's vast resources of raw materials.

Our great Colonies must not only be independent industrially but they must also be independent to a large extent in regard to scientific research. They must have their own research workers carrying out investigations on the spot: for it is no longer sufficient to send samples to the Imperial Institute. The task of training the educated young men of India to qualify for research and technical work must be an essential part of the organisation of every scientific and technical department. Owing to the fact that the European growers of beetroot had been able to successfully compete with the Indian cane sugar producers, and that the manufacturers of synthetic indigo had been able to practically kill the Indian indigo industry, it has been assumed that tropical countries would not be able to hold their own against European or American competition, but what can be done in Europe under the disadvantages of a temperate climate, could be done still more abundantly and successfully in India. It will, however, be absolutely necessary to bring the individual and isolated chemists of India into one organisation. At present only the fringe of the various great chemical problems in India has been touched. There is a single chemist to analyse the doubtful materials passed by the Collector of Customs, another to inspect explosives, another to assist the Director of the Geological Survey, a tinctorial chemist to the Madras Government, and another lonely chemist in the Forest Research Institute at Dehra Dun. Each of these suffers from isolation, from want of *esprit de corps* and from lack of prospects; and even among these isolated units there is a good deal of overlapping and duplication of work. The matter has been considered by the Industrial Commission which has expressed the wish that the Conference at Lahore should suggest a scheme of official organisation.

The principal chemical problems in connexion with Government activities are divided among: (a) agriculture; (b) forest products; (c) drugs, perfumes, essential oils and dyes; (d) tanning; (e) sugar and alcohol manufacture; (f) saltpetre refining; (g) salt and khari manufacture; (h) mineralogy; (i) metallurgical inspection; (j) explosives manufacture. For administrative purposes these might be controlled in three groups: (a) Agricultural chemistry, with the chief laboratory at Pusa. (b) Organic chemistry, with two chief laboratories at Dehra Dun and Bangalore. (c) Mineral chemistry, with the chief laboratory at Kalimati or Calcutta.

After making suggestions in regard to the necessary staff and the appointment of a chief chemist or three deputy chief chemists to the Government of India, Sir Thomas expressed the opinion that all results of scientific and practical value should be published in the records of the Indian Chemical Department, to be issued in three series and edited by the three deputy chiefs. Once a year the whole staff of chemists might assemble for a week's conference at Pusa, Dehra Dun, Bangalore and Calcutta successively. This conference should be attended by private chemists, including manufacturing chemists and chemical members of the Education Department, and the papers read, if approved by a small committee, might be published in the records, which would thus attain a definite position of authority and value in scientific literature.

Although such a scheme would hardly be practicable in war time, several matters of immediate practical interest arising out of the scheme proposed should be considered. Among these are: (1) increasing the production of certain chemicals needed in the textile and other large industries; (2) assisting firms with advice and research; (3) the preparation for the medical services of drugs which could be as easily made in a laboratory as in a factory; (4) investigation of raw materials; (5) publication of results. In regard to drugs for the medical services there would be probably dozens of students willing to prepare these in their spare time, and the authorities would no doubt grant the necessary facilities. The following investigations are now being pursued in the Chemical Departments of the various educational institutions in India: Electrolytic preparation of white lead, refining of waste copper, enzymatic hydrolysis of fats, utilisation of copper waste, preparation of soluble chromates from chrome iron ore, conversion of acetylene into acetaldehyde and acetic acid, dyeing of skins and furs, oxidation of alcohol to acetic acid, colloidal medicinal preparations, tamarind fruit as a source of tartaric acid, purification of nim and til oils, manufacture of citric acid, manufacture of formaldehyde, the poisonous principle of ricin in castor-oil cake, isolation and cultivation of the specific yeast associated with mahua flowers, efficiency of various methods of estimating sugar, Burmese black varnish as an electrical insulator.

The speaker then discussed the question of the best means of making the results of research available to manufacturers and to other workers who may be working on similar lines. Some of the reports will be read at the Science Congress and afterwards published as a supplement to the journal of the Asiatic Society, but it would be an advantage if the papers on chemical questions were kept together in a separate publication, which would be recognised by workers in other countries as covering all that really matters in regard to chemical work in India.

A more difficult question is that of the conditions under which advice should be given to, and research undertaken by, industrial firms. One or two suggestions were made and the possibility of official chemists acting as consultants to private firms was also considered. Another important question is whether the results of a technical investigation undertaken on behalf of and at the expense of a manufacturing firm should be published. Sir Thomas Holland said: "The general interests of the public and the special interests of the firm might perhaps be met by adopting a

recognised interval before publication; but this course becomes in practice far less simple than it seems; for there is seldom a definite date for concluding an investigation: it always dovetails into side issues and dependent investigations. So far as I have been able to study this difficult question there appears to be a balance in favour of the conclusion that a public official should be purely a public servant; he should treat with confidence results placed at his disposal but should be free to publish those obtained as the outcome of his researches. Ordinarily, publication is so late and is necessarily so imperfect compared with the practical points known to the firm for which the work is done, that the firm gets a sufficient start ahead of its competitors in the same line. Often they would be able to obtain patent protection for essential parts of a new method."

In considering the question of co-ordinating chemical research, it is obvious that a systematic investigation of Indian raw materials, especially vegetable products, is among the most urgent. In spite of the valuable results obtained at Dehra Dun, at the Indian Institute of Science, at the Imperial Institute in London, and in various Indian colleges, only the fringe of this subject has so far been touched. For this work the chemist requires the co-operation of the Departments of Agriculture, Forests and Botany. It thus appears desirable to organise the chemical fraternity for representation on the Board of Scientific Advice.

Finally, on the subject of an Indian Section of the Society of Chemical Industry, Sir Thomas said:—"In addition to the question of official organisation it has been suggested that we might consider a proposal to establish in India a Section of the Society of Chemical Industry. The size of the country is against the adoption of any one capital city as a centre, while in each city the number of chemists is insufficient for the effective discussion of subjects. An alternative suggestion, which is at variance with the usual organisation of the Society, is to form a section which will meet annually as a branch of the Science Congress." [*A complete report of the address is given in the "Pioneer Mail" (weekly edition), Jan. 18, 1918, from which the above abstract has been made.*]

BRITISH ASSOCIATION OF CHEMISTS.

The following is an official list of the Local Secretaries of this Provisional Society:—

Mr. H. Royal-Dawson, 155, Bradford Road, Huddersfield.

Mr. F. C. A. H. Lantsberry, 63, Walford Road, Sparkbrook, Birmingham.

Mr. G. R. Bolsover, 31, Rossington Road, Brocco Bank, Sheffield.

Dr. E. P. Hedley, c/o Messrs. British Cellulose Co., Spondon, near Derby.

Mr. B. Hickson, c/o Messrs. Hickson and Partners, Ings Lane, Castleford, near Leeds.

Dr. J. H. Paterson, The Green, Wallsend-on-Tyne.

Mr. A. H. Goodger, 131, Manley Road, Whalley Range, Manchester.

Dr. F. W. Kay, The Chemical Dept., The University, Liverpool.

Prof. J. S. S. Brame, 3, Vanbrugh Fields, Blackheath, London, S.E.

Mr. B. D. W. Luff, 85, Ashley Terrace, Edinburgh.

Mr. H. Mansfield, Westmore, Ferryside, South Wales.

Mr. W. H. Coleman, 1, Athole Gardens, Newlands, Glasgow.

CORRESPONDENCE.

SACCHARIN AND GLUCOSE IN HUMAN DIETARY.

SIR,—In your issue of March 15 a note is published under initials "A. R. C.," on certain portions of which I venture to offer some comments. I have nothing to add to what your correspondent says in regard to saccharin, since that substance is admittedly a flavouring agent and not in any sense a food like the sugars. The question whether the use of saccharin as a sweetening agent for food is attended with any physiological effects is one on which little can be said definitely at the present time.

When we come to glucose, as your correspondent remarks, "the matter stands on a different footing." Glucose is in fact one of the ordinary sugars.

I note that your correspondent has nothing to say against the use of glucose itself, but I take exception to what he suggests in regard to this sugar being liable to contain arsenic, owing to the fact that in its manufacture sulphuric acid is employed. The occurrence of arsenic in the glucose made by one particular firm some eighteen years ago was traced, it is true, to the use of crude arsenical sulphuric acid, which was an accident pure and simple. This was, however, purely fortuitous, and it may be pointed out that manufacturers of glucose have always been aware of the danger of using arsenical acid for the conversion of starch. Indeed, at the present time those firms who are responsible for the manufacture of glucose and other sugars in which sulphuric acid is used, without exception exercise the greatest care in examining the acid they employ and the product they turn out. Glucose seldom contains as much arsenic as 1/700th grain per lb., equal to one part in 4,900,000.

Since the regrettable incident to which I have referred, the word glucose was for some time to members of the general public almost synonymous with arsenic. This I can well understand from those who know no better, but I should not have expected similar views from a correspondent in your Journal.

Your correspondent suggests that other acids, notably hydrochloric acid, might be used instead of sulphuric acid for hydrolysing starch. In certain circumstances hydrochloric acid is used, but the commercial acid would contain too much arsenic to meet the very stringent requirements of the present day.

My object in asking you to publish this short note is to clear away once and for all any impression, at least among chemists, that glucose contains anything but the most minute trace of arsenic.—I am, etc., A. R. L.

March 25, 1918.

SIR,—In my note on *Saccharin and Glucose in Human Diet*, I wrote "The possible contamination of glucose with arsenic seems to deserve continued attention," and I am glad to learn from your correspondent "A. R. L." that this attention is now being given to the matter by the manufacturers. The occurrence of arsenic in the glucose which caused the Manchester epidemic can hardly be regarded as "an accident pure and simple" in the ordinary sense, since cases of poisoning occurred for many months, and this could not have happened from the accidental contamination of a single lot of glucose. If the manufacturers were aware at that time "of the danger of using arsenical acid for the conversion of starch," it suggests that their precautions were singularly inadequate, and it is obvious that the matter "deserves continued attention."—I am, etc.,

April 3, 1918. A. R. C.

NEWS FROM THE SECTIONS.

CANADA.

A meeting of the Toronto Section was held under the chairmanship of Mr. S. B. Chadsey on December 21 last. Dr. A. Tingle, of the Customs' Laboratory, Ottawa, read a preliminary communication on "The Acidimetry of Coloured Solutions: An Application of the Pocket Spectroscope."

The device of determining the end-point of a titration by observation with a spectroscope originated from the difficulty experienced in titrating deeply coloured alkaloidal solutions, from which the colouring matter could not be eliminated without upsetting the quantitative results. Two similar vessels are provided, one holding the solution to be titrated and the other, an equal volume of distilled water. To the latter one drop of the standard alkali is added, and then an accurately measured volume of the indicator, drop by drop, until a sharply defined absorption band is obtained, the position of which is noted. This position marks the end-point. The same amount of indicator is added to the liquid to be titrated, and then the titration is performed in the usual way, the spectroscope taking the place of the naked eye. It is found in most cases that the end-point coincides with a shifting of the absorption band and not with the substitution of one band for another. The instrument used was a direct vision Beck-Thorp Diffraction spectroscope, and the experiments were conducted with cochineal and methyl orange, of which much larger amounts had to be used than in ordinary titrations. The author has found that this spectroscopic method is very nearly, if not quite, as accurate as the normal procedure, and that it is applicable in many cases where the end-point of a reaction is otherwise indeterminable.

NEWCASTLE.

An informal meeting was held in Newcastle on March 20, at the outset of which Mr. H. Peile, the chairman, moved that the members should express their deep regret at the loss the Society had sustained by the death of Mr. Thos. Tyrer, and that a letter of condolence should be sent to the relatives. Dr. J. T. Dunn seconded and the motion was duly carried.

The Officers and Committee for the next session were then elected. Prof. P. Phillips Bedson was voted to the chair, Mr. H. Peile was appointed vice-chairman, and the following were elected as new members of the Committee: Prof. H. Louis, Mr. E. M. Fletcher, Mr. G. Hamilton, Mr. G. W. Porteous, and Mr. A. Trobridge.

After the business proceedings, Mr. H. Scragg contributed a note on "The Deleterious Effect of Using Saline Oil Coke in the Manufacture of Carbon Electrodes." Saline oil coke came principally from Russia and contained 6—7 per cent. of sodium chloride. Its presence in a furnace prevented the attainment of the requisite high temperatures, the average reduction being about 300° C., hence it was not expelled from the furnace but merely passed from one part to another. It had been found in practice that the sodium chloride content increased from 6 per cent. in the original to 8 per cent in the calcined material, and the insoluble ash from 0·80 to 1·2 per cent., the latter being probably due to the action of the fused chloride on the furnace lining. The low density of saline oil coke might be due to the low temperature at which it was calcined, to an inadequate baking temperature, or to the presence of sodium chloride in the block preventing the escape of volatile matter; and there was experimental evidence in favour of the two latter reasons. In the course of the discussion, Mr. Scragg stated that all the best oil coke was used in aluminium manufacture, and that for this purpose it was mixed with other ingredients, such as gas carbon and anthracite.

The next item was a contribution by Mr. S. H. Collins on "The Estimation of Naphthalene in Pesticides." Owing to its volatility, naphthalene was difficult to estimate by simple methods, but good results had been obtained by extracting in a Soxhlet apparatus with a solvent prepared by distilling common methylated ether at 27—33° C. If not more than one half of this solvent were recovered and the remainder expelled with a current of air, no loss of naphthalene occurred. The residue could be dried in two days without loss in a desiccator containing equal parts of granulated fused calcium chloride and naphthalene balls, the object of the latter being to saturate the atmosphere with naphthalene vapour and to absorb ether vapour.

Mr. D. W. Jones then exhibited a differential manometer of a type formerly made exclusively in Germany but now manufactured in Newcastle, and of which the sensitiveness was ten times greater than when water was used in a vertical U-tube. The instrument shown contained a colourless and a red liquid of different specific gravity and could be set at an inclination.

A wedge optical pyrometer was next shown by Mr. A. Short.

In the discussion, Mr. O. Smalley stated that in his experience the temperature of a stream of metal could never be gauged accurately with an optical pyrometer; and Dr. P. terson remarked that such instruments were quite useless for light rich in ultra-violet rays. His firm was now using a trustworthy photographic method with the aid of which a workman could keep a furnace within 300—400° of the temperature required.

A discussion on calorimeters and the exhibition of a specimen of cuprous oxide now being manufactured in Newcastle brought an interesting evening to a close.

NOTTINGHAM.

The annual meeting of the Nottingham Section was held on March 20, when the Secretary's and Treasurer's Reports were presented and adopted, and the Officers and Committee for the ensuing session were elected. Mr. F. H. Carr is now chairman, and Dr. Caven and Mr. S. R. Trotman, vice-chairmen. The new members of the Committee are: Messrs. E. P. Hedley, J. Marshall, E. P. R. Prideaux, and W. P. Skertchly.

Sectional bye-law No. 3 was altered in order to provide for the retirement of one-third of the Committee by rotation each year, those retiring not being eligible for re-election for one year.

The membership is growing steadily and at the present time there are 130 members against 106 at the beginning of the session. Further accessions are confidentally anticipated, and applications for membership are coming in from the Derby area in such numbers that the holding of a proportion of the sectional meetings in that area will require serious consideration. The Nottingham Section may well be said to have entered on a new phase of its existence.

Dr. E. P. Hedley then read a paper on "The Application of Science in Industry." He first drew attention to the world-wide awakening to the value of scientific research, urging that the British nation must learn to realise that its future existence depends upon the utilisation of research. Forty years ago England was predominant in the manufacturing world; that she is not so now is due, not to the lack of business ability or

financial skill on the part of the manufacturer, but to a refusal to utilise applied science. It is therefore necessary to expand and increase our Universities and Industrial Laboratories.

There are three kinds of Industrial Laboratories: (1) Analytical and Control Laboratories, (2) Factory Development Laboratories, (3) Research Laboratories. Research Laboratories are most needed in this country.

The type of man who should control such a laboratory should be a man of wide and deep scientific training and knowledge, and in sympathy with pure science. He must have organising ability and actual personal experience of works processes. Applied science is so different from academic science as to necessitate several years post-graduate training. When a works has obtained a suitable man it should give him a seat on the board.

The author then discussed the means by which the research laboratory may be made highly efficient. Efficiency in a works laboratory depends not only on the same conditions that obtain in a University laboratory, but in addition upon questions of cost, yield, and personality. The problem resolves itself into the question of producing a scientific atmosphere within the works. This can be done by permitting the publication of much of the research work in scientific journals, and by weekly discussions of their work among the staff.

The question of profit-sharing as a means of promoting efficiency was discussed, and the absolute need for ready access to a good technical library was pointed out. The importance of the newly-founded Research Associations was then emphasised.

A table was shown giving some ideas of the immense sums spent on scientific work by some firms in the United States. These sums ranged from £6000 to £100,000 per annum, and the scientific staff in the various laboratories varied from 15 to 400 trained men.

A brisk discussion followed in which the chairman and Messrs. Pentecost, Carr, Millington, Archbutt, Richmond, Gray, Prideaux, and Wilkie took part.

BIRMINGHAM.

The members of this Section assembled on March 21 to hear the reading of two papers, Mr. L. P. Wilson presiding. Mr. W. Clifford, in his note on "The Utilisation of Waste Nessler Solution," described a process he had found useful for recovering and utilising mercuric iodide from the distillates obtained in ammonia determinations. The iodide is precipitated by the addition of a little sulphuric acid and then decomposed with iron filings, giving mercury and ferrous iodide. The latter is treated with sodium cabonate or caustic soda to precipitate the iron (a second precipitation is necessary to remove it completely), and after filtration the sodium iodide is left in the solution. About 85—90 per cent. of the mercury is recovered in the metallic state.

"Mercury Fulminate and its Determination" was the subject of the next paper by Mr. G. S. Heaven. After the method of preparing this detonator by the action of mercuric nitrate in alcohol had been described, and details given concerning its purification and method of storage, the author gave the results of specific gravity determinations on fulminate of different colours and grain size. These varied from 1·34 for pale fine powder to 1·57 for the darkest and most coarse. The physical and chemical properties were referred to briefly and then two typical methods of analysis were described, by one of which the mercury was isolated and weighed as mercurous chloride, and by the other (suitable for compositions containing antimony sulphide) as mercuric sulphide.

There was need for a complete method of determining the constituents of detonators when only one sample was available. One could remove the composition from the shell by deforming the latter in two directions at right angles, estimate the fulminate by the thiosulphate method, the antimony as sulphide, and the chlorate by difference; but estimating by difference was unsatisfactory except in the case of standard products.

A third paper in the name of Dr. D. F. Twiss on the "Discoloration of White Paint" was postponed to the next meeting.

BRISTOL.

At the annual general meeting, held at the Bristol University on March 25, the following members were added to the Committee: Messrs. J. Bernard, E. F. Hooper, E. Walls and J. M. Dodds. Mr. W. J. Cooper was elected vice-chairman, and the remain ng officers and members of the Committee were re-elected.

The Chairman, Dr. T. Howard Butler, gave an address in which he reviewed the past session, and stated that whereas the Section started with only 57 members, the total was now 123. The average attendance at the meetings was 31. The success of the meetings was due in no small measure to the consideration of the Senate of the Bristol University in allowing the free use of the necessary rooms, and their thanks were also due to the same body for the unsparing efforts that were being taken to make the Annual Meeting of the Society a success.

The January meeting arranged to be held in South Wales did not take place, but the Committee hopes to be able to hold some meetings in Cardiff during the next session.

A vote of thanks was passed to the Chairman, Officers and Committee; a letter of thanks was directed to be sent to the Senate of Bristol University; and on the motion of Mr. Boorne, a vote of sympathy to Mrs. Thomas, daughter of the late Mr. Thomas Tyrer, was carried in silence.

The ordinary meeting which followed was an open discussion on the corrosion of common industrial metals, and members exhibited specimens of a very interesting character. Dr. Rixon gave a brief outline of the theory of the electrolytic action involved in the corrosion of metal.

LONDON.

At the meeting of the London Section on March 25, the chairman, Dr. Charles A. Keane, announced that the Annual Meeting of the Section would be held on May 6, when the election of new members of the Committee would take place under the new Rules of the Section, to which the assent of the Council has now been accorded. Owing to the order for the "Curfew" at 10.30, the Committee has decided that the next meeting shall begin at 7.30 instead of 8 o'clock. The Chairman also announced that before long a Board Room will be acquired at the Society's new Headquarters, Central House, Finsbury Square, and it is hoped that it will become a rendez vous in London for members. It was with deep regret that members learned of the sudden death of Mr. C. G. Cresswell on March 22. Mr. Cresswell was the first General Secretary of the Society, an office which he held until his retirement about two years ago and in which he did so much to promote the advancement and well-being of the Society.

The evening was given up to a paper on "Some Cotton-seed Products in relation to Present Day Needs" by Mr. E. C. de Segundo. Instead of reading the paper the author gave a very lucid résumé of his main points and paved the way for an interesting discussion.

There are two varieties of cotton-seed, the "bald"

or "black" which bear fibre of long staple, easily removed by the "ginning" process, leaving the seed "bald," and the "upland" or "woolly" which in addition to long staple fibre is covered by an undergrowth of short fibred "fuzz." The amount of bald seed produced is relatively a small portion of the world's cotton crop, and in the past the bulk of it was secured by British seed crushers. Not unnaturally two methods of treating the seed were developed which may be referred to as the British and American. In the former the whole seed is crushed and a dark-coloured oil obtained which for most purposes requires considerable refinement. The industry affords an interesting example of changes brought about by altered conditions and advances in technology, for originally the oil-crusher's object was to obtain what oil he could, much of which was used for soap making, but mainly to produce a valuable and highly favoured cattle food—cotton-seed cake. Now, however, conditions have changed and the chief desideratum is to obtain a large yield of highly purified oil that can be used for the manufacture of margarine, for which it is probably second to none as a raw material. The American crusher on the other hand, dealing mainly with the woolly variety, could only obtain an unsatisfactory cake if the whole seed were crushed because of the large amount of adherent fuzz. Consequently, more elaborate methods of preparation were adopted which may be comprehended under the term "decortication." By mechanical means the seed is cut open and separated into husk or "hulls" and kernel or "meats," the fibre left on the husk enabling it to mat together and ensure separation from the kernel, and of late years machines have been devised to recover the short fibres also from the husk. The kernels are crushed alone and yield a relatively pure oil, the amount of which is lightly greater than that obtained when the whole seed is treated direct. From figures given by the author, based on long experience and careful averaging, the American shows a profit over the British system of 11s. per ton of seed treated. The short fibres from the hulls can be utilised for the manufacture of paper, explosives, artificial silk and other cellulose derivatives. In addition, cotton seed, in common with most other oil-bearing seeds, contains no starch and the meal obtained from it is therefore valuable as a food, for example, in cases of diabetes. But owing to the large quantities available, at least during the present stress of circumstances and the world shortage of food-stuffs, its use as a diluent for wheat in bread-making is attracting serious attention especially in the United States. Some specimen loaves, containing admixtures of cotton-seed meal, prepared by the author for the benefit of members present, were pronounced very satisfactory and palatable and its large proportions of protein and fat are guarantees of its high dietetic value. It seems that the time has come when the simpler British method must be replaced by the more elaborate system of treating cotton-seed, especially in view of the fact that the bald variety can only be grown under rather special climatic conditions whereas huge areas within the Empire—for instance, the Anglo-Egyptian Sudan—are capable of yielding enormous quantities of woolly seed. Treated by the American process, such seed, grown within the Empire, would furnish very large quantities of material for the manufacture of margarine, an increased supply of fibre not only for the spinning industry of Lancashire, but also for paper, explosives and cellulose compounds, and a valuable meal for bread-making, apart from cattle food. The paper gave rise to an interesting discussion, in which many points of American practice were emphasised by Mr. Erwin W. Thompson, and it was a matter of some regret that the British cotton-seed oil industry was not represented.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

The fifteenth meeting of the Society was held on March 20, at Newcastle-on-Tyne.

Mr. S. N. Jenkinson, who presided, read a paper on "Some Causes of Pot Failure." The causes dealt with were honeycombing, holing, external cracks, and excessive solubility of pot bottoms. Observations have been made on pots made of two kinds of clay, heated both in direct fired and gas furnaces.

The conclusions drawn were that as regards pitting, a high temperature (as attained in the gas-fired furnace) was beneficial, and of two clays, the more aluminous was the better. External cracks were regarded as arising from sudden fluctuations of temperature, most frequent with a coal-fired furnace; whilst internal cracks developed as the result of too rapid absorption of heat by the batch. Honeycombing occurred as the result of careless picking of raw clay, nodules of pyrites being eaten out rapidly by the glass. Although the bottoms of the pots are cooler than any other part of the pot, it was found that they dissolve faster than any other part.

In conjunction with Mr. G. V. Wilson, who examined the pot fragments microscopically, the conclusion was drawn that the presence of *sillimanite*, formed in the pot at a high temperature, acted as a protective agent.

Mr. A. P. Roxburgh read a paper entitled "A Note on a Coke Gas Producer Fired Tank Furnace for the Production of White Glass." The author dealt with the need of fuel economy in all industries requiring a high temperature, and described the preliminary experiments undertaken with Mr. Ferry, which had led to the evolution of the new tank furnace.

In the latter the producer was built as part of the furnace, and was charged from a hopper above, the charge for the furnace already built being about one cwt. per hour. Special arrangements were made for cooling the fire bars and for rotating them so as to remove ash. The gas for the producer was taken off at a point below the top of the fuel bed and passed through a dust chamber where dust was trapped and the gas was thereby cleaned. The secondary air was recuperated, and improvements in this respect were being worked out. A furnace was in actual operation for the melting of lead glass, and the results obtained so far were sufficiently encouraging to justify further experimental work.

A third paper was read by Mr. S. English on "A Simple Device for Preheating the Gas and Air in a Blowpipe." A very hot flame was produced, by means of which it was possible to work Jena combustion tubing, and to blow a bulb on it after softening.

COKE OVEN MANAGERS' ASSOCIATION.

On March 23, at Darlington, Dr. J. T. Dunn, of Newcastle-on-Tyne, gave an address before the Northern Section of this Association on "The Chemist and the Coke Oven." The address indicated generally the scope of the chemist's work on a by-product coking plant, possible lines of development in coking practice under capable scientific control, and led to the conclusion that men of the widest possible training in chemistry and the physical sciences generally should find places in the industry.

Our present knowledge of coal and coke was exceedingly small. Investigation of coal by means of solvents, by Dr. Bedson and others, had disclosed something of the character of its constituents and the relationship between the coking property of some coals and their resinous com-

ponents: but these experiments had been done on only a small number of varieties, and there was great scope and need for further investigation. Very little was known, too, about the nature of the coking process. There seemed to be little doubt that it was due to the cracking of hydrocarbons formed when the coal was first heated, and to the formation of others less volatile and poorer in hydrogen, which were deposited upon the solid residue and formed the binding material which made all the difference between coke and an incoherent mass; but beyond this general statement very little definitely was known. As lines of investigation he suggested the study of the gases given off in the first hours of carbonisation with simultaneous examination of the tars; also the composition of the gases evolved from steam coals, like those of Northumberland, many of which contained considerable volatile matter, and yet would not coke, or coked very poorly. Whatever new knowledge might be arrived at, either as to the nature of the raw material, or as to what precisely took place in the oven, meant better control of the coking process. There was also the fact that no present method of distillation enabled us to recover anything like the whole of the nitrogen in the coal, so that here again there was room for investigation. In the meantime there was scope for the well-trained chemist in relation to proposals which had been made for the recovery on coke oven plants of ammonia as nitrate, with nitric acid obtained electrically by utilising surplus power. Still further: there was need for more investigation of refractory materials in relation to coke oven construction, so that the utmost possible proportion of the heat generated in the ovens should be used in actual coking. In this connexion it had been found that the molecular transformation of quartz into tridymite was not an instantaneous operation at a given temperature, and therefore it was not sufficient for the maker to heat his bricks up to that temperature, but to keep them there for a considerable time.

A good deal of discussion followed the address, and the hope was expressed that it might engage the attention of coke oven owners. Mr. W. Diamond, of Marley Hill, presided at the meeting.

ROYAL METEOROLOGICAL SOCIETY.

In a lecture before the Royal Meteorological Society on March 20, Dr. J. S. Owens described the methods adopted and the results obtained during the last four years by the Advisory Committee on Atmospheric Pollution. The standard gauge was described, also an apparatus for measuring suspended impurity by filtering a known volume of air through white filter paper and comparing the resulting discoloration with a calibrated scale of shades. He said that the latter method showed there was roughly about 1 milligram of suspended matter per cubic metre in average London air.

The deposit collected by the standard gauge was removed by filtration or settlement, the undissolved matter was then extracted with carbon bisulphide and the residue ignited, thus dividing it into tarry matter, carbonaceous matter, and ash. The dissolved impurities, after drying, were ignited and thus divided into loss on ignition and ash. Sulphates, chlorides, and ammonia dissolved in the rain-water were also estimated.

Dr. Owens reviewed shortly the results obtained and, dealing with the effect of rainfall, demonstrated by curves showing a full year's figures for 18 stations, that while rain had a marked effect in increasing the deposit of soluble matter, insoluble deposit was practically unaffected.

It was shown that the amount of deposit was always greater in winter than summer, and much heavier in cities than in the country; Oldham, for example, during 1915-16, had a deposit of 950 tons per square mile, while Malvern Wells, in the country, had only 56.

Tar derived from smoke was shown to be very high in cities, and especially so in Sheffield air, probably owing to the need for smoky combustion in certain metallurgical processes.

Insoluble mineral matter showed a tendency towards a maximum in summer, due doubtless to dust; ammonia was sometimes higher in summer than in winter and sometimes the reverse; tar, sulphates and chlorides showed distinct winter maxima. Sulphates, being derived mainly from coal smoke, are produced in greater quantity in winter; chlorides probably come mainly from sea-spray, which is also produced in greater quantity in winter.

A table was shown (reproduced below), which brings out the great variation in composition in the deposit at different stations.

In conclusion, a plea was made for the investigation of certain problems on aerial pollution, which the lecturer stated required more light; some of these were:—The relation of the distribution of impurities to wind. The vertical distribution of impurity. The relation between degree of impurity and death-rate from, or distribution of, respiratory diseases. Is there a relation between active bacterial contents of the air and smoke pollution, *e.g.*, does smoke reduce the number of bacteria in air? What is the mechanism of the selective action of rain in bringing down certain impurities and leaving others? Effect in obstructing light. Distance suspended matter travels from its source, *e.g.*, what is the origin of the bluish haze which attends easterly winds?

Table showing Composition of Deposit at four representative Stations, given as:—(A) *Metric tons per sq. kilometre, and* (B) *per cent. of total deposit. Both* (A) *and* (B) *based on mean monthly deposit a year.*

	Tarry matter.		Carbonaceous or sooty matter.		Mineral matter insoluble in water.		Combustible or volatile matter soluble in water.		Mineral matter soluble in water.		Total deposit.		Sulphates as SO_3.		Chlorine as Cl.		Ammonia as NH_3.	
	Tons per K^2.	%	Tons per K^2.	%.	Tons per K^2.	%	Tons per K^2.	%	Tons per K^2.	%	Tons per K^2.	%	Tons per K^2.	%	Tons per K^2.	%	Tons per K^2.	%
Oldham 1915-16........	0·22	0·71	6·40	20·08	16·38	53·2	2·41	7·8	5·4	17·5	30·81	100	2·55	8·3	0·88	2·86	0·18	0·58
Sheffield 1914-15 (Attercliff)	0·28	1·31	3·75	17·6	9·27	43·5	1·79	8·4	6·23	29·3	21·31	100	2·83	13·3	1·57	7·35	0·08	0·38
London 1915-16 (average of 8 stations	0·112	0·76	2·3	15·6	5·33	36·2	1·98	13·4	5·03	34·1	14·76	100	2·14	14·5	0·68	4·7	0·103	0·7
Malvern 1915-16 ..	0	0	0·15	8·25	0·26	14·3	0·49	26 9	0·91	50·0	1·82	100	0·42	23·0	0·195	10·7	0·015	0·82

NEWS AND NOTES.

AUSTRALIA.

Raw Materials in Queensland for Paper, Twine, Dyes, etc.—H.M. Trade Correspondent at Brisbane states that the supply in Queensland of materials for the production of paper pulp is practically inexhaustible. The "blady grass" of North Queensland, where tens of millions of tons are available, is quite equal to that of the Malay variety for paper making, and a simple method of preparing the pulp has been worked out by Mr. J. Campbell, of Kamma, Queensland. This consists in treating the grass in open pans with a mixture of washing soda and lime of 8° T., equal in amount to 5 per cent. of a caustic soda solution of 60 per cent. strength. As the loads of grass are brought to the mill platform, two cuts are made lengthwise by means of a hay knife, making the length of grass about 1 ft. 6 ins., but, in order that the length of fibre may not be too long for the breaking engine and to suit other requirements, the grass is put through a power chaff-cutter, thus reducing the length of fibre to about ¾ in. Two tons of dry blady grass yield one ton of half-stuff of 80 per cent. cellulose. Pandanus and pineapple tops are treated in the same way.

Other native materials suitable for paper manufacture are, Chinese Burr, *Sida retusa*, waste cotton plants, Lantana, and Pandanus. The last is probably one of the best paper fibres in the world, and is suitable for high-class official paper, bank notes, etc.; the pulp is readily bleached. *Sida retusa* and Chinese Burr make an excellent fibre which is valued at £40 per ton. Banana stems treated when green, just after the fruit has been cut, yield 1¼—1½ per cent. of their weight of high-class fibre, worth £40 per ton, and by treating the juice expressed, potash (K_2O) to the extent of 1 per cent. of the whole weight of stem, can be obtained. The juice also yields an excellent dye.

Mr. Campbell has given the results of many experiments made by him on the production of dyes from indigenous plants.—(*Bd. of Trade J., Mar.* 28, 1918.)

CANADA.

The Government of Ontario is about to carry on an extensive investigation of the possibilities of peat as a fuel, and is asking the Provincial legislature to vote 100,000 dollars for the purpose.

SOUTH AFRICA.

The output of the Transvaal gold mines during 1917 was 9,022,212 oz., in value £38,323,921. In 1916, 9,295,538 oz. were produced, value £39,484,934.

The new wattle bark extract factory at Merebank, near Durban, Natal, is nearing completion. Equipment is almost complete, and production may be looked forward to in the near future.

Natal industrialists are seriously considering the further exploitation of the iron ore occurrences in the vicinity of Pietermaritzburg. A small blast furnace has been in existence for some years past at Sweetwaters, and the experience gained in the treatment of these ores should serve a useful purpose now that a revival of interest in the iron industry has taken place.

GENERAL.

Sesamum Crop in British India.—The following is the final forecast of the acreage and yield of sesamum in British India (exclusive of Burma). Acreage under sesamum, 4,094,000 acres, a reduction of 18 per cent. compared with last year; yield, 340,000 tons, a decrease of 26 per cent.—(*Indian Trade J., Jan.* 18, 1918.)

Cork Substitutes in Austria.—To find a substitute for cork, experiments have been made with the pith of elders, and more successfully with the pith of sunflower stalks. A much better substitute is supplied by dried and pressed fungus. This is lighter and more elastic than natural cork, and has better insulating qualities. The raw material is plentiful in Hungarian forests; and as its collection and drying present no great difficulties, the country may become independent of foreign supplies.—(*Pester Lloyd. Bd. of Trade J., Mar.* 21, 1918.)

Sulphuric Acid in the U.S.A.—The following estimate of the production of sulphuric acid during 1917 is issued by the United States Geological Survey, based on returns received from 98 per cent. of the manufacturers. The production of the remaining 2 per cent. has been estimated from previous records.

Strength of acid.	1916.	1917.
	Short tons.	Short tons.
50° B.	1,829,471	2,306,372
60° B.	1,119,753	1,187,704
66° B.	1,580,100	850,006
Stronger acid	443,332	1,190,019

The estimated increase of production of 1917 over 1916 is 600,000 tons, in terms of 60° B. acid.—(*Amer. Fert., Feb.* 16, 1918.)

Magnesite.—The total world production before the war was about 300,000 tons, of which Austria-Hungary supplied two-thirds, Greece about 80,000 tons, and India a little less than 10,000 tons per annum. The Austrian product was imported into this country mostly in the calcined form, but that from other countries was crude. The demand has very greatly increased since the outbreak of war. In Canada there are important deposits in the neighbourhood of Quebec, from which less than 600 tons were raised annually before the war, but early in 1915 these deposits furnished some 15,000 tons for the demand of the munitions factories of the Entente Powers. British Columbia and the Yukon district have also important deposits, but it is not known if they have yet contributed anything to the common needs. While Canada, particularly Quebec, was doing what it could to supply the void left by the disappearance of Austrian mineral, deposits were ascertained to exist in different parts of Australia. Queensland was tried, but here it was found that the deposits were not sufficiently extensive to be worked upon a commercial basis; in South Australia more important deposits were discovered, but the local needs were such that it was not easy to obtain a surplus for export. The Transvaal has contributed a modest proportion, but, so far, South Africa has fallen far short of expectations. The Indian workings have been greatly developed during the progress of the war, and India promises to be one of the principal sources of supply so far as the British Empire is concerned, but it is by no means certain that we shall be able to rely upon supplies, adequate for our needs, from within the confines of the Empire.—(*Statist, Mar.* 9, 1918.)

Potash in the U.S.A.—In the course of a recent lecture, Mr. C. M. Barton, vice-president of the Dupont Nitrate Co., stated that potassium nitrate was being successfully extracted from the company's "Caliche" at Oficina "Delaware," which contained an average of about 5 per cent. KNO_3.

The sodium nitrate mother liquors are concentrated until the crystals deposited contain about 25 per cent. of potassium nitrate. Up to October, 1917, at least 5000 tons of nitrate, in the form of 20,000 tons of the 25 per cent. product, had been extracted, and it is now being produced at the annual rate of 10,000 tons of 25 per cent. material, or 1200 tons of potash (K_2O). The Dupont Company is responsible for about 1 per cent. of the total production of the Chilian nitrate fields, and it is estimated that if all the producing companies were to follow its lead, some 240,000 tons per annum of potash (K_2O) could be secured.—(*Feb.* 16.)

At the present time seventeen large kelp-reduction plants are in operation in California, of which about half are located in the neighbourhood of San Diego. The quantity of kelp harvested in 1917 was 398,898 tons, of an estimated value of $2,100,000. Kelp products are now being sold at the rate of $4.5—5.0 per unit of potash, but the fertiliser trade is not taking much.

A new plant for recovering potash from cement dust by the Cottrell process is being installed at Newago, Mich., where a recovery of 2½ tons per day in the form of sulphate is anticipated. The Western Precipitate Co., of Los Angeles, has now erected nine precipitation plants, of which three are in actual use, and the remainder will be ready in a few weeks. The industry is regarded as a permanent one. The initial cost of the plant is high, but the running costs are exceedingly low, and it is claimed that the process could be worked at a profit with potash at pre-war prices.

Potash is being extracted from saw-mill ashes by the California Potash Co. of Sacramento, which receives the refuse from the burners of twenty-five lumber mills. About 1 lb. of ashes, containing 5—15 per cent. of K_2O, and for which $2 is paid, is obtained from 1000 lb. of Californian white or sugar pine; red-wood ash is less valuable. There is talk of raising the field fern on waste land, as the ashes of this plant yield 20 per cent. of potash. —(*Mar.* 2, *Amer. Fert.*, 1918.)

Electric Steel Making.—When Sir W. Siemens designed the first electric arc furnace in 1879, he foretold that it would be useful for reactions requiring a high temperature combined with "freedom from such disturbing influences are inseparable from a furnace worked by the combustion of carbonaceous materials." The prediction has proved correct, for it has been fully demonstrated that with proper handling the electric furnace is capable of producing steel superior to that obtained in the open-hearth furnace, a result that is mainly due to the fact that "fusion is effected in a perfectly neutral atmosphere."

The following claims are made for electric steel:—A standard composition, in consecutive heats, is more easily obtained in the presence of easily oxidisable metals like vanadium, silicon and manganese; and owing to the diminution of losses smaller amounts of these metals need to be added and there is less oxide to be removed. The improvement in control of the composition gives more successful heat treatment, and overheating is less injurious than with other steels. A wider heat range is obtained, and the steel withstands to a greater degree variations in forgings and heat treating without injury. The low sulphur and phosphorus content make the segregation of these elements impossible, whilst reducing the percentage of cropping and increasing the yield of sound metal. The low sulphur content of electric steel also shows that the prior reducing conditions are favourable to complete deoxidation and the production of sound ingots. The electric steels are more free from slag and non-metallic impurities than other steels. Alloy additions may be made in the furnace itself, thus providing more thorough assimilation and diffusion and a more homogeneous metal. Electric smelting involves a smaller loss of scrap metal in the slag in comparison with the open-hearth process. In view of the rapidly increasing use of alloy steels, the prevention of loss of the alloying elements is becoming a matter of importance.—(*U.S. Iron Trade Rev.*, *Jan.* 24, 1918.)

Iron in Japan.—Japan will need much iron for her big shipbuilding programme, and her recent efforts to secure supplies in America met with little success. It is now reported that a company has been formed to work a new process for extracting the metal from Japanese sand (*osekido*). The process, which has been devised by Dr. Hirayama Matsuji, of the Japanese Home Department, is estimated to give a 50 per cent. yield of iron at a cost of 20 yen (40s. 10d.) per ton of iron produced. The sands in question cover vast tracts of country. A company with a capital of 500,000 yen has been formed to conduct further large scale experiments at Kanzaki, west of Osaka. The output for the present will be about 5—6 tons per day.—(*Eastern Commerce*, *Jan.* 1918.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Petroleum.

In replying to a question put by Captain Wright, Mr. Kellaway (Parliamentary Secretary to the Ministry of Munitions), said that at the moment the Government has under consideration applications to bore for petroleum from three different firms, and negotiations are practically completed, but pending definite conclusion of the agreements, it is not proposed to publish the names. The agreements would give exclusive rights to bore within certain defined areas. Outside those areas, applications by colliery companies and others possessing freehold and surface rights over large districts and the necessary boring tackle will be carefully considered on their merits.—(*Mar.* 21.)

Oil Seed.

Captain Wright asked the Parliamentary Secretary to the Ministry of Food whether, with a view to rapidly increasing the manufacture of margarine and its by-product, feeding cake for live stock, all possible steps by way of provision of buildings plant, etc., and importation of the palm-nut kernels and other oil seed are now being taken.

Mr. Clynes: Yes, Sir; we are lifting from the West African Colonies practically every seed, nut, and kernel for which freight space is available. Of the resultant refined oil, the largest proportion is allocated to margarine manufacturers, and the average weekly output of margarine has risen from 1500 tons in 1913 and 1914 to 5038 tons in February, 1918. Every effort has been made to increase the available plant, and to the greatest possible extent edible oils have been withdrawn from all industrial uses.—(*Mar.* 21.)

Cattle Feeding Cake.

The Parliamentary Secretary to the Ministry of Food, answering Mr. A. Richardson, said that it was incorrect to state that imports of cattle cake had been cut off owing to the action of the Food Controller in fixing maximum prices. The importation of oil seeds is of greater national importance at the present time than that of cattle cake. —(*Mar.* 21.)

LEGAL INTELLIGENCE.

Supply of Defective Stills. *Hedley and Co., Ltd., v. J. Howson and Sons, Ltd.*

This case came before Mr. Justice Avory and Mr. Justice Shearman, sitting as a Divisional Court in the King's Bench Division on March 18, for argument on appeal by plaintiffs from a decision of Mr. Pollock, Official Referee at the High Court.

Mr. Compston, K.C., and Mr. Storry Deans appeared for the appellants and Mr. Distumal, K.C., and Mr. M. Macnaghten represented the respondents.

Mr. Compston said the action was brought to recover damages for alleged breach of a contract by defendants to supply plaintiffs with certain earthenware vessels for distilling hydrochloric acid for the production of ethyl chloride. Plaintiffs were a well-established firm of chemical manufacturers at Leytonstone, and defendants were pottery manufacturers at Hanley, Staffs. Plaintiffs' case was that in December 1914 defendants contracted to construct and supply stills for producing ethyl chloride, and if that were established it was not disputed that the contract had been broken because two stills had been supplied which were admittedly useless. The contract was the outcome of a communication from plaintiffs to the Secretary of the Staffordshire Pottery Manufacturers' Association asking for a firm who would make stills which were capable of being filled with hydrochloric acid and being slowly heated up to 100° C. Defendants replied to the letter, undertaking to execute work for the plaintiffs. Plaintiffs' case was that the stills supplied by defendants were porous and allowed the acid to leak away. The Official Referee held that the contract made in December, 1914, was varied as to certain terms in January, 1915, and that the provision of the original contract, which plaintiffs said was a contractual obligation, was put an end to, although one variation of the December contract was only as to price and with regard to the trial of one still for a month before there should be any obligation to take more; and another variation was made in May, 1915. The Official Referee, as he contended, wholly failed to give effect to the implied warranty which plaintiffs said was clearly established under Section 14 of the Sale of Goods Act, namely, that where a buyer expressly or by implication made known to the seller the purpose for which the goods were required, there was an implied condition that the goods supplied should be reasonably fit for the purpo e. Plaintiffs put their case on two branches, namely, express warranty, or if not express, implied warranty, and the Official Referee had wholly failed to mention their case of implied warranty. A further question arose on a counter-claim by defendants, upon which the Official Referee had given them judgment.

At the conclusion of counsel's arguments on March 19, the Court gave judgment.

Mr. Justice Avory said the question was really one of express or implied warranty. He had come to the conclusion that plaintiffs' managing director, in giving the orders, was proposing not to rely upon any warranty, but upon his own decision after trying one of the stills after it was delivered. Plaintiffs themselves seemed to have recognised that the defendants were only trying to make stills suitable for the purposes specified. In fact the whole of the evidence showed that plaintiffs were not relying on any express warranty. His Lordship thought that the defendants did not impliedly warrant that they would supply stills which would even hold water. They merely undertook, at the plaintiffs' request, to do their best to make a still which would be suitable for the purposes of the plaintiffs' business. In order to make it suitable it was necessary to make it, not like ordinary earthenware to hold water, but in such a way that it would also withstand the effects of heat, acid and gas.

It was found that the material used in the making of the vessel of the large size required, cracked, and therefore he (Mr. Justice Avory) had come to the conclusion there was not even an implied warranty that the vessels would hold liquid. The buyers made it clear that the defendants were relieved of their responsibilities as they had never made any stills before of any kind. The evidence showed that the defendants had never in fact made any stills of any kind. They did not profess to make stills at all. The evidence for the plaintiffs showed that no person in England had up to that time made stills suitable for this purpose. Therefore it was impossible to say that the buyers in the present case were making known to the sellers the purpose for which the goods were required in such a manner as to show that the buyers were relying on their skill and judgment. The buyer himself attended a consultation for the purpose of determining the material with which these experiments should be conducted, and it was not necessary, therefore, to decide whether the goods were of the description which it was in the ordinary course of the sellers' business to supply. In his opinion, however, the stills were not goods of a description which it was in the ordinary course of the sellers' business to supply. That was sufficient to dispose of the claim in the action.

As regards the counterclaim, plaintiffs' managing director, on the occasion of a visit to the works, proposed that the defendants should supply him with two tanks which he saw there, and which he suggested might be joined together to make a still to be used temporarily in plaintiffs' business. A discussion took place as to how they should be joined, and ultimately they were joined together and delivered to the plaintiffs and invoiced to them at £46. Plaintiffs refused to pay for them and returned them on the ground that they were useless for the purpose, as they leaked. The Official Referee had found as a fact that the tanks as joined together when they left defendants' works were acid-tight, and the reason they leaked when tested by plaintiffs was that they were tested when in a wrong position. The Referee had found that the defendants did in fact supply that which they contracted to supply, and the plaintiffs were bound to pay for them. There was ample evidence on which he could come to that conclusion, and his judgment on that point also ought not to be disturbed.

The appeal must therefore be dismissed with costs.

Mr. Justice Shearman concurred.

Treatment of Pyrites Residues.—In the Patents Court on March 21, before the Comptroller of Patents, an application was made by Mr. T. Smith, Copthall Avenue, E.C., on behalf of the British Sintering Co., Ltd., for a licence to use an "apparatus for continuous oxidation, reduction, or other treatment of ores, metallurgical products or the like, by means of gas or air passed therethrough" as specified in Patent No. 29,779 of 1909, the property of Baron Felix von Schlippenbach, of Stolberg, Binsfeldhammer, Rhineland.

Appearing for applicant, Mr. J. Gray said that the patent in question was an improvement on No. 25,895 of 1907, in respect of which a licence had already been granted to the present applicant early in 1917, and he had also been granted a licence by the Court to use three associated patents for the treating of the fines of

imported concentrates. The present application had an important bearing on the question of tonnage, as Mr. Smith had found that the process could be applied to treating the residue obtained in the manufacture of sulphuric acid. A large quantity of this material was now in the possession of the Government, and after sintering it could be used in the manufacture of iron and steel. It was an important national matter that the applicant should succeed in getting his plant in working order on a large scale at an early date.

The applicant had had plant erected. The British Sintering Co. had bought two plants, each treating 600 tons of ore per day, one for Middlesbrough and one for a South Wales smelting works; other plant had been ordered of 100 tons capacity, and it was hoped ultimately to put down plant to the extent of 15 units. It was suggested that whenever Schlippenbach improvements are utilised there should be an extra payment of £10 per plant. The Schlippenbach patent is for a horizontal rotary annular hearth with a chamber beneath by the action of which a continuous oxidation is effected. There is an air or gas duct with exhaust; the air current caused the particles to amalgamate without blowing any away, and yielded a manageable commercial agglomerate.

The applicant gave evidence that the cost of the plant would probably approach £200,000. The plants for treating the 600 tons of ore per day were now under erection. The plant was for iron concentrates, and after it had been developed, for pyrites residues of which large quantities were available. The matter was urgent as it was hoped to save a large quantity of tonnage.

Dr. A. Mond, in opposing on behalf of the patentee, suggested that the royalty to be paid should have relation to the capital expenditure.

The Controller said he was satisfied that in spite of great difficulties the applicant had done his best, and there was no reason why the licence should not be granted. The matter was one of some public importance. This patent was obviously an improvement on those the applicant had already got, and it would be impossible not to allow the licence if the applicant desired it. He had taken steps to put the process into operation and under those circumstances the licence would be recommended. The matter of royalties could be re-opened by interested parties after the war, and determined at a future date.

Permanganate of Potash Contract. *E. G. Taunt* v. *S. Fleming and Co.*

In a King's Bench Divisional Court on March 25, Justices Avory and Shearman had before them the case of an appeal by Messrs. Elmer G. Taunt, chemical merchants, of Wormwood Street, E.C., against the award of an arbitrator in their action against S. Fleming, trading as S. Fleming and Co., of Mark Lane, E.C.

Mr. Rigby Swift, K.C. (with him Mr. Hartley), for the appellants, said this matter arose out of a contract in writing for the sale of permanganate of potash. His point was that the arbitrator ignored the written contract, and found against his client on another ground. Under a contract of May 17, Messrs. Fleming were to deliver 8 cwt. of permanganate of potash in London at 11s. 1½d., and appellants' letter stated that it was to be "as per sample pre-war in 2 cwt. drums." Pre-war permanganate meant that which was manufactured before the war. A dispute arose as to whether the potash was good potash. The arbitrator found that it was not a sale by sample, but it was a sale of potash of merchantable quality. Before the arbitrator, it was stated on behalf of Fleming's that they did not notice the words "as per sample." Counsel submitted that great injustice might be done if business men were to have their contracts set aside as this had been done, because when a dispute arose the arbitrator preferred for some reason a verbal version of the negotiations and arrangement between the parties, and disregarded the written contract under which he got the whole of his jurisdiction to decide the matter.

Without calling upon counsel for the other side, the Court dismissed the appeal with costs.

Mr. Justice Avory said it was clear that there was no error of law apparent on the face of the award, and therefore the appeal could not succeed. Before the appellant could succeed there must be some error of law apparent on the face of the award.

Mr. Justice Shearman agreed, and said an appeal from the award of an arbitrator was a very limited one. Persons selected an arbitrator, and were bound to accept from him both his decisions on fact and on law. The only way in which an arbitrator's decision on a point of law could be contested was that it must be submitted in the form of a special case and if his mistake in law was put by him on the face of his award. There was no foundation for suggesting that that had been done here. His impression was that the arbitrator had decided the point rightly in this case, but it was not necessary to go into it.

Appeal dismissed with costs.

GOVERNMENT ORDERS AND NOTICES.

SUPERPHOSPHATES (AMENDMENT) ORDER 1918.

The Minister of Munitions, in exercise of the powers conferred upon him by the Defence of the Realm Regulations, and of all other powers enabling him, hereby Orders as follows:—

1. As on and from the date of this Order until further notice, the maximum prices to be charged or paid for superphosphate sold or purchased in quantities of 14 lb. and over but less than 2 cwt. for delivery ex vendor's store or shop, or ex warehouse, railway goods yard or public wharf, shall be the prices specified in the Schedule to the Order relating to Superphosphates made by the Minister of Munitions on the 20th August, 1917, with the addition of the following amounts, according to the quantity of superphosphate included in the sale or purchase, namely:—

Quantity Sold or Purchased and Additional Price Authorised.

1 cwt. and over but less than 2 cwt.	2s. per cwt.
28 lb. and over but less than 1 cwt.	3s. ,, ,,
14 lb. and over but less than 28 lb.	4s. ,, ,,

and there shall be no restrictions on the price to be charged or paid for superphosphates sold or purchased in less quantities than 14 lb. for delivery as aforesaid.

2. The foregoing provisions shall have effect as and by way of amendment of paragraph (c) of clause 1 of the said Order of the 20th August, 1917. And paragraph (d) of clause 1 and clauses 2 and 3 of the said Order shall henceforth apply and have effect as though the additional prices authorised by paragraph 1 of this Order had originally been authorised by paragraph (c) of clause 1 of the said Order of the 20th August, 1917.

3. This Order may be cited as the Superphosphates (Amendment) Order, 1918.

Note.—All applications in reference to this Order should be addressed to the Director of Acid Supplies, Ministry of Munitions, Explosives Supply Department, Storey's Gate, Westminster, S.W.1. and marked "Fertilisers."

March 28, 1918.

OILS AND FATS (RESTRICTION) ORDER, 1918.

This Order was issued by the Food Controller on March 23. Its object is to prevent any of the oils or fats mentioned in the subjoined Schedule for being used for purposes other than human or animal consumption. Licences for exemption are issued in certain cases.

Schedule: Cocoanut oil, cotton seed oil, gingelly (sesamé) oil, ground nut oil, kapok-seed oil, maize oil, mowrah seed oil, niger seed oil, palm kernel oil, poppy seed oil, shea butter or oil, soya bean oil, sunflower seed oil, neutral lard, oleo oil, premier jus, tallow, stearine (beef and mutton), dripping, lard.

LIGHTING, HEATING AND POWER ORDER, 1918.

The effect of this Order, issued by the Board of Trade on March 26, is to restrict the consumption of gas and electricity to five-sixths of the amounts consumed in the corresponding quarter of 1916 or 1917. The Order applies only to London and the counties of Norfolk, Cambridge, Huntingdon, Northampton, Oxford, Gloucester, Somerset, and all counties situated south of them, including Devon and Cornwall. It does not apply to any premises which are, or are part of, an establishment controlled under the Munitions of War Act, 1915, to hospitals, railway stations, goods yards, etc., to premises used for cold storage, or to any place where gas or electricity is manufactured, generated, or transformed under statutory powers. Parts III. and IV., relating to the closing of or the extinction of lights in public rooms, shops, restaurants, etc., applies to the whole of the United Kingdom. Licences for exemption may be granted by the Board of Trade.

[For full text, see *Bd. of Trade J.*, Mar. 28, or *London Gazette*, Mar. 29.]

OTHER ORDERS.

Raw Cocoa (Prices) Order, 1918. Ministry of Food.

Cocoa Powder Order, 1918. Ministry of Food.

Cocoa Butter (Provisional Prices) Order, 1918. Ministry of Food.

Jute (Restriction of Consumption) Order, 1918. Army Council. March 23.

Home-Grown Timber Prices Order, 1918. Board of Trade, March 25.

IMPORTS AND EXPORTS.

Under "Prohibition of Import (No. 23) Proclamation, 1913," a Proclamation, dated March 22, prohibits the importation into the United Kingdom, except under licence, of: Molasses and invert sugar and all other sugars and extracts from sugar which cannot be completely tested by the polariscope, and on which Customs duty is not otherwise charged.

The Controller of Coal Mines has issued directions (March 22), concerning shipments of coal, coke-oven coke and patent fuel to Denmark.

Non-Ferrous Metal Industry Act, 1918.—Notice was given on March 19 that the Rules of Court under Section I, sub-section (5), of the Non-Ferrous Metal Industry Act should come into immediate operation as Provisional Rules.

BRITISH PHARMACOPŒIA.

In pursuance of the *Medical Act*, 1858, and of the *Medical Council Act*, 1862, the General Council of Medical Education and Registration of the United Kingdom have caused to be altered and amended "The British Pharmacopœia 1914," printed and published for the General Council by Messrs. Constable and Co., Limited, 10, Orange Street, Leicester Square, London, W.C.2., by withdrawing from the same until further notice certain medicines and compounds and the directions for preparing them, and by modifying certain other directions therein contained, as set forth in the following schedule; and the alterations and amendments so made shall continue to have effect until further order respecting them is duly made according to law.

SCHEDULE.

The following are withdrawn until further notice, namely:—

Linimentum Camphoræ, Linimentum Chloroformi, Linimentum Hydrargyri, Linimentum Terebinthinæ Aceticum, Liquor Cresol Saponatus.

The following notes are appended to the official monographs on Adeps Præparatus, Oleum Arachis, Oleum Olivæ, Oleum Ricini, Oleum Sesami, and Sevum Præparatum, respectively, namely:—

Adeps Præparatus. Sevum Præparatum.

In the United Kingdom, Wool Fat, or Hydrous Wool Fat, singly or together, with such addition (if any) of Hard Paraffin, Liquid Paraffin, Soft Paraffin, Paraffin Ointment, White Beeswax, Yellow Beeswax, or any combination of these, as may be necessary to impart a proper colour and consistence to the product, may be employed in making the official preparations for which Prepared Lard, or Prepared Suet, is directed to be used; but the official proportion of the active ingredient must in all cases be maintained.

Oleum Arachœs. Oleum Olivœ. Oleum Sesami.

In the United Kingdom, Arachis Oil, or Sesamé Oil, may be employed in making the official Liniments, Ointments, Plasters, and Soaps, for which Olive Oil is directed to be used.

Oleum Ricini.

In the United Kingdom, the modified castor oil of commerce, commonly known as "neutralised seconds castor oil," may be employed in making the official preparations for which Castor Oil is directed to be used.

On behalf of the General Council,

DONALD MACALISTER,
President.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, March 21, 28, 1918.)

OPENINGS FOR BRITISH TRADE.

Applications have been received at the Department of Overseas Trade for the names of British manufacturers or producers of: celluloid, clear transparent (in sheet form), and of sulphite pitch.

An agent in Toronto wishes to represent U.K. manufacturers of cutlery and dyes in Ontario. (Ref. No. 65.)

A firm wishes to obtain agencies in Ontario for U.K. manufacturers and exporters of raw materials for the paint trade, including oils, dyes, etc. (Ref. No. 77).

A British firm seeks agencies for U.K. manufactures in the chemical and allied trades in India, Ceylon, Straits Settlements, Siam and the Far East. (Ref. No. 75.)

A Johannesburg firm of indent agents and importers of timber, carbide, etc., desires to obtain agencies for U.K. manufactures of builders' hardware, tinplates for canneries, sheep dip, etc. (Ref. No. 80.)

A Spanish firm, with a London branch, which imports alimentary and pharmaceutical products, and exports cork, resin, etc., wishes to take up further agencies.

TARIFF CUSTOMS EXCISE.

British India. Three Notifications have been issued (Jan. 26, 1918) superseding former notifications concerning the duties payable on opium imported into the Punjab and North-West Frontier Province.

Bermuda. The following materials have been placed (Feb. 6, 1918) under the control of the Supply Control Board (which regulates imports, exports, sales and consumption):—Soap, kerosene oil, imported fertilisers.

Brazil. An import duty of 5 per cent. *ad val.* is levied on milling machinery.

Canada. From Jan. 26, 1918, the prohibition of the importation of intoxicating liquors does not apply to intoxicating liquors for medicinal purposes, nor to intoxicating liquor for manufacturing or commercial purposes, other than for the manufacture or use thereof as a beverage.

An Order in Council of January 19, 1918, deletes from the list of exports prohibited to countries other than British, the item "Explosives of all kinds," and substitutes therefor: To all destinations:—Nitroglycerin, any explosive containing glycerin: To all destinations abroad other than the U.K., British Possessions and Protectorates:—Explosives of all kinds, other than those containing glycerin—the exportation of which is prohibited to all destinations.

French Colonies. The exportation and re-exportation of the scales of the ablet (*ablette*) or other fish, and of the essence "Orient" extracted therefrom, to all destinations other than French, has been prohibited as from March 2, 1918.

Nigeria. Regulations dealing, *inter alia*, with the adulteration of produce were made on Jan. 1, 1918. Among the materials affected are: Palm kernels and oil, cocoa, rubber, and hides and skins.

Sweden. Export Prohibitions as from March 13: Manufactures of cement (Nos. 36 to 39 of the Swedish Tariff); terpineol, safrol and menthol (No. 1217 of the Swedish Tariff).

United States. The following have been added to the Conservation List and will require licences for export: Maccaroni, spaghetti, vermicelli, noodles, crackers, biscuits, wheat cereals and other products made from wheat, rye flour, rye meal, linseed meal, plate rolling mills, open-hearth blast furnaces, steel furnaces, rubber and all commodities containing rubber.

Validity of Export Licences.—In a further Ruling, dated February 8, the War Trade Board announces that all export licences issued on and after January 22, 1918, shall be valid for a period of ninety days except in the case of special commodities where a different period is specifically prescribed or allowed. The term of an ordinary export licence has hitherto been sixty days from the date of issuance. Extensions of licences issued on or before January 21, 1918, will be granted as heretofore. The Bureau of Exports has discretion to grant licences valid for a period not exceeding six months in cases where the article to be exported must be specially manufactured, and there is satisfactory evidence that more than ninety days are required for its manufacture and shipment; otherwise no extensions whatsoever of any of these licences will be granted, and in case of expiration before shipment, a new licence must be applied for.

TRADE NOTES.

BRITISH.

Sulphuric Acid Trade Meeting.—A meeting of sulphuric acid makers was held on March 22 at the Cannon Street Hotel, E.C. Mr. Max Muspratt was in the chair, and there was a large attendance. The report of the Sulphuric Acid Trade Vigilance Committee was received and adopted, and on the motion of Sir William Pearce, seconded by Mr. E. P. Chance, a resolution was passed to form a National Association of Sulphuric Acid Makers. The principle of the resolution was in accordance with the recommendation of the Government Departmental Committee (this J., 1918, 118 R), but an important condition precedent was attached. The following is the full text of the resolution:—

(A) That this meeting of the Sulphuric Acid Manufacturers of the United Kingdom, which has been summoned for the purpose of considering the report of the Departmental Committee on the Post-war Position of the Sulphuric Acid and Fertiliser Trades, and particularly the recommendation therein as to the formation of a strong National Association of Sulphuric Acid Makers of a representative character, expresses its acquiescence in that recommendation, but, as an indispensable prelude to the formation of such an Association, desires that the Sulphuric Acid Trade Vigilance Committee should, with such other persons as it may consider it desirable to appoint, solicit an interview with the President of the Board of Trade, or with any other Minister or Ministers concerned, for the purpose of urging and receiving an assurance that the recommendations contained in the Departmental Report referred to will, so far as H.M. Government is concerned, be carried into effect.

(B) That the Vigilance Committee hereinbefore referred to, and the Sulphuric Acid Advisory Committee to the Ministry of Munitions, appointed by the Association of British Chemical Manufacturers and the Fertiliser Manufacturers Association, together with two representatives of the Gas Council and two representatives of the Explosives Industry, and a duly elected representative of the London and South of England Sulphuric Acid Association, the South Wales Sulphuric Acid Association, the Midland Sulphuric Acid Association, the Yorkshire Sulphuric Acid Association, the Lancashire Sulphuric Acid Association, the North of England Sulphuric Acid Association, and the Scottish Sulphuric Acid Association, with power to add to their number, be requested to act as an Organising Committee to arrange the details of the projected Association's constitution, and to report.

Progress of Chemical Manufactures in Canada.—It is estimated that more than $100,000,000 has been invested in Canadian chemical works since the outbreak of war. Among the many new products of which the manufacture has been taken in hand are: acetic acid, acetates, acetone, sodium bichromate and other chrome products, asperin, resorcin, sodium benzoate, benzoic acid and salvarsan. Benzol and toluol are now being recovered from coke-oven gases; and the carbide industry has received a remarkable impetus, although the present high prices, due to transport difficulties, hamper business. In view of the enormous amount of undeveloped water-power, and of the very extensive deposits of ores of nickel, cobalt, molybdenum, etc., there can be

little doubt that Canada will ultimately take a foremost place in the manufacture of electrochemicals.

Steps are being taken to make barium sulphate and peroxide from barytes, and the large deposits of magnesite in the Ottawa region have not only provided the material for making star-shells, but metallic magnesium has been turned out at Shawinigan Falls of a higher purity (99·75%) than has yet been achieved in Europe. The first works in America to make cyanamide is located in Canada at Niagara Falls; its present production is at the rate of 64,000 tons per annum, and the product is exported to the United States, for conversion into the fertiliser known as "Ammo-phos." Cobalt compounds are now used for making "dryers" in paint and colour works, and an important market has been suddenly found for "stellite," the cobalt-chromium alloy used for tool-cutting. (This J. 1910, 1253; 1913, 28; 1915, 1058, and 1917, 1238.) E. Haynes of Kokomo, Indiana, has recently introduced a new iron-stellite alloy, called "Festal metal," which will be marketed shortly for cutlery purposes. This alloy has the non-rusting and non-staining properties of the original stellite, but it is much more malleable and of greater elasticity.—(*Can. Chem. J., Feb.*, 1918.)

FOREIGN.

Japanese Foreign Chemical Trade.—H.M. Commercial Attaché at Yokohama reports a general rise in the export trade of Japan during 1917, but small declines in the case of (*inter alia*) sulphur and camphor. The increased export of copper was due to the larger supplies sent to the United Kingdom and France; Russia, the largest buyer in 1916, took very little. Habutae exports improved, owing to increased purchases by the United States, while exports of refined sugar increased by 9,570,000 yen (1 yen = 2s. 0½d.), mainly to Siberia and the Far East. Coconut oil showed a substantial increase, the bulk going to Russia and the United States. The increase in imports was smaller than in the exports; raw cotton, hemp and flax, saltpetre, oil cake, pig iron, and iron manufactures were among the materials showing the most substantial gains. Imports of oilcake increased by 18,040,000 yen, owing to its use as a substitute for ammonium sulphate as a fertiliser, the price of the latter having advanced considerably since the beginning of the year. More sulphate of ammonia was imported than in 1916, but, owing to the increased domestic output, an export business has begun, and supplies from the United Kingdom will probably diminish. Substantially more caustic soda and soda ash were imported, mainly from the United States.

A Chemical Industries Exhibition was held in Tokio last autumn, where the most important products displayed were: dyes, acetic acid, and other products of wood distillation, and double superphosphate of lime. The last named, which may be exported from Japan without special licence, is in special demand for the sugar plantations in Java. After the war the Japanese exporters of this fertiliser should be in a strong position, provided they can obtain sufficient mineral phosphate. Their chief sources of supply are the Rasa and Yap Islands (Japanese), the Christmas and Ocean Islands (British), and the Island of Anguar, formerly German, but now in Japanese occupation.—(*Bd. of Trade J., Mar.* 14, 21, 1918.)

Cellulose Production in Russia.—There are now but two firms in the whole of Russia which manufacture cellulose, the "Sokol" Gesellschaft and the Revaler Cellulosefabrik. As the combined output of these firms amounts to only 760,000 poods (12,160 tons) per annum, Russia is completely dependent upon imports from Finland. Finland, however, will only export paper.—(*Z. angew. Chem., Jan.* 1, 1918.)

Hankow (China).—This consular district comprises the provinces of Aupeh, Kiangsi, Shensi, Kansu, four-fifths of Honan, Chinese Turkestan, Kokonor in Tibet, and a part of Mongolia. Omitting the unproductive region of Kokonor and of Mongolia, it covers an area of 950,278 square miles, and has a population of 77,691,000.

Foreign Trade.—The gross imports during 1916 were valued at £6,200,000, and the exports (plus re-exports of Chinese goods) at £2,100,000. To the imports the U.K., the U.S.A., and Japan contributed 6·7, 16. and 46 per cent. respectively; and of the exports these countries took 14·6, 8, and 30 per cent. respectively. Thus Japan held the premier position.

The imports included:—Acids (736,000 lb.), asbestos (107,200 lb.), crucibles (valued at £1600), leather (valued at £25,000), match-making materials (4,488,800 lb.), medicines (valued at £4350), paints (168,733 lb.), photographic materials (valued at £2600), printing ink (50,000 lb.), bar soap (valued at £25,200), toilet and fancy soap (valued at £9400). The local market is still feeling the shortage of dyes; 57,067 lb. of indigo, valued at £12,400 were imported in 1916, compared with 141,733 lb. valued at £20,200 in 1915; also 1,573,400 lb. of other dyes, compared with 1,460,000 lb. in 1915.

The exports totalled £21,200,000 and included albumen, antimony, beancake, raw cotton, hides, oils (bean, nut, wood, rape-seed, sesamé and tea), peanuts, quicksilver, ramie, sesame seeds and tallow (both animal and vegetable). The following table indicates the destination of some of the items:—

Article.	U.S.A.	U.K.	Japan.	Total.
	Tons.	Tons.	Tons.	Tons.
Cowhides	5,212	147	1,775	10,952
Buffalo hides	680	178	—	1,363
Wood oil	23,532	624	852	33,476
Sesame seed	—	14,791	1,450	50,537
Gall nuts	826	551	26	2,072
Cotton	520	156	15,947	46,624
China grass	38	301	4,812	6,967
Tallow—vegetable ..	1,488	—	160	15,405
Tallow—animal	5,105	287	1,193	3,923

There was an unusually heavy demand for goatskins, cotton, and vegetable tallow. Animal tallow was also in good demand and gallnuts, sesamé seed and beans commanded enhanced prices, although shipments were smaller. It may be noted that American purchases during 1916 (£2,900,000) show an increase over 1915 of 80 per cent.

Industrial.—The district offers cheap labour, water transportation, availability of raw products and available sites, though land is not cheap. A combination of the three principal coal and iron companies has taken place, forming the Han Yeh Pig Iron and Coal Company, which produced during 1916, 603,732 tons of iron ore, 47,180 tons of limestone and 9553 tons of dolomite. There is a large British cold storage plant, and the Government paper mill, which is suffering from shortage of supplies, produced 90,000 reams of paper.—(*U.S. Com. Rep. Suppl., Dec.* 29, 1917.)

Industrial Alcohol in the U.S.A.—A plant for the production of alcohol, estimated to cost not less than $3,000,000, is in course of erection at Luke, Maryland. The raw material will be obtained from the adjoining works of the West Virginia Pulp and Paper Co. The new factory will be ready in about three months, and other products besides alcohol will be manufactured. The U.S. Government is providing the necessary capital.—(*Oil, Paint, and Drug Rep., Feb.* 4, 1918).

COMPANY NEWS.

LEVER BROTHERS, LTD.

Addressing the twenty-fourth annual meeting held at Port Sunlight on March 26, the Rt. Hon. Lord Leverhulme said that five of the company's factories were still in enemy hands, but the stage was passed when any loss could result therefrom. Notwithstanding that the cost of wages and chemicals was about £4 per ton higher than before the war, the company has to supply the Government with glycerin at a pre-war price, which is about one-fourth of the present world's price. Lever Bros. have not "profiteered" in any way. The business, whose policy has always been a small profit and a large turnover, now includes 80 companies, in which the whole of the ordinary capital is held by Lever Bros. The greatest profit made on Sunlight soap was £2 2s. 4d. per ton, *i.e.*, under ¼d. per lb., in 1915, and the greatest loss was £2 3s. 11d. per ton in 1917; during the whole war period a loss of 6s. 7d. per ton has been incurred. The average profit on margarine manufacture has been 8½ per cent. Last year's profit on the coconut plantations in the Solomon Islands (which were nursed without remuneration for 10 years) was three times that realised in 1916; but, on the whole, the war has hindered the development of the production of raw materials. The company's fleet of 9 steamers was taken over by the Government, and the subsequent advance in freights represented merely increased costs of insurance and losses from enemy attack. The Government had also commandeered stocks of certain oils and fats at the bare invoiced prices paid by the company, and then the goods were immediately invoiced back to it and other firms at prices which showed a profit of £95,000. A new margarine factory covering 6¼ acres and a new oil-refining plant are in course of erection. Great help is being derived from the process of hydrogenation. A Government department had informed them that the prohibition of the manufacture of toilet soap was being seriously considered, for the alleged reason that such soap is a luxury. This attitude was entirely mistaken, because (1) fats used for toilet soap give a proportionately larger yield of glycerin than others; (2) toilet soap is drier than laundry soap, and consequently outlasts it; and (3) the prohibition would throw many thousands of people out of work. Alluding to the subject of a six-hour working day, Lord Leverhulme said that it was not intended to introduce it unless or until the trials now being made in individual departments had turned out satisfactorily; but the prospect was encouraging.

On the financial side, £1,179,000 of new capital had been issued, and fresh proposals were on foot for the consolidation of the First Preference with the "A" Preference shares, and the "B" with the "C" Preference shares. During 1917, £272,000 was spent on repairs and renewals, and £309,000 was written off for depreciation. Profits show an increase of £234,000, and the dividend on the Ordinary shares was now restored to 15 per cent. per annum. On a paid-up capital of £15,200,000, the net profit was £1,211,000, approximately 7½ per cent.

THE BRITISH ALUMINIUM COMPANY, LTD.

The eighth ordinary general meeting of shareholders took place on March 26, at Winchester House, E.C., Mr. A. W. Tait, chairman of the company, presiding. In moving the adoption of the report and accounts, Mr. Tait said that the trading profit for 1917 was £423,662, an increase of about £44,000 over the previous year. The company, however, is not trading in the ordinary sense, as the whole output is used for munitions, and the price to consumers is fixed by the Government. The world's consumption of aluminium today is approximately five times what it was 10 years ago. The future of the aluminium industry is certainly encouraging; there is an enormous field for development, in which the company will be able to take its share owing to its strong resources and sound financial position. Directions in which the application of aluminium may be extended are for airships, aeroplanes, motor cars, agricultural and commercial vehicles, the chemical and brewing trades, and the electrical industry, chiefly for transmission lines. The scheme which the company had putforward for developing its hydro-electric power in Inverness-shire, near Kinlochleven, and which was now before Parliament, had been approved and supported by the Board of Trade and the Ministry of Munitions. If the application were successful it would involve the provision of more capital. The reserve fund investments now stands at £220,599, as compared with £73,147, and £200,000 has been invested in War Loan. Over £22,000 had been applied to the reduction of debentures, and £75,000 had been added to the depreciation reserve account (now £400,000). The dividends paid or payable include 6 per cent. on the Preference shares and 12 per cent. per annum on the Ordinary. The financial position was a good one, and if the industry were freed from Government interference and control, there would be every hope for the future.

THE YORKSHIRE INDIGO, SCARLET AND COLOUR DYERS, LTD.

The annual meeting of this company was held at Huddersfield on March 14. The report and accounts which provided for a dividend of 10 per cent. per annum, and the allocation to the reserve fund of £5869 (making it up to £25,000), were approved. The chairman, Mr. P. Marsden, referred to the purchase of the freehold property at Buslingthorpe, Leeds, and also outlined the reasons which had led to the decision of the directors to capitalise a proportion of the reserve fund by increasing the amounts paid up on the Preference and Ordinary shares by 3s. 4d. and 1s. 8d. respectively, thereby making them stand at 10s. and 5s. fully paid. The net profit for 1917 was £19,500, compared with £12,400 in 1916 (£5000 in 1913), and the carry forward is now £12,776, nearly £6000 greater than for the previous year.

NEW REGISTRATIONS.

British Cellulose and Chemical Manufacturing (Parent) Company, Ltd.—This company has been registered as a private concern, with a capital of £3,500,000 in £1 shares, with the main object of controlling a subsidiary, operating company with a similar title. The directors include Lieut.-Colonel W. G. Morden, Commander Sir A. Trevor-Dawson, Sir Lionel Phillips, Sir Mitchell Mitchell-Thomson, and Drs. C. and H. Dreyfus. According to the *Times*, the operating company has already made very rapid strides, and it is understood that arrangements have been made for expending upon the construction of works and equipment £5,000,000, which will be taken out of the profits as they are earned.

The National Metal and Chemical Bank, Ltd., has been registered as a private company, with a nominal capital of £1,000,000 in 100,000 shares of £10 each. Among the objects defined in the memorandum of association are: To prospect, explore, and work mines, to carry on business as metal dealers, consulting engineers, chemists, assayers, etc. The directors must be of British nationality. The registered office is at 70, Lombard Street, E.C.

OBITUARY.

SPENCER CHAPMAN.

In the regretted death of Mr. Spencer Chapman we have to record the loss of an original member of this Society, and of one who was associated with British chemical industry for nearly half a century. At the time of his death, Mr. Chapman was senior partner in the firm of Messrs. Spencer Chapman and Messel, Ltd., of Silvertown and Bow, London, E., the well-known manufacturers of sulphuric acid and related products. He died at Hove, Sussex, on March 21 last, aged 74 years, and was interred at Brompton Cemetery on the 23rd.

C. G. CRESSWELL.

Charles Gerard Cresswell, an original member of this Society and its Secretary for over 30 years, died suddenly at his home at Ashtead, Surrey, on March 23. He was born at Barnes, Surrey, in 1854, and was educated at Ewell and at the Royal School of Mines. He was for a time assistant to Dr. Thudichum, with whom he studied some of the compounds occurring in the brain, and later was employed as chemist at the Weston Iron Works, Widnes, and with Messrs. Chance Brothers, Oldbury; at the latter works he investigated certain problems connected with the disposal of alkali waste and the recovery of sulphur.

Cresswell's official connexion with this Society commenced in 1883. Up to that time the business had been transacted by an Honorary General Secretary (G. E. Davis), assisted by Honorary Metropolitan, Northern, and Foreign Secretaries, but the activities of the Society had by then begun to extend so much that it became necessary to appoint a Secretary who could devote his whole time to the work. The choice of the Council could have fallen on no one more loyal or faithful than Cresswell, who, during his long term in the office, devoted himself whole-heartedly to furthering the interests of the Society, and he had the satisfaction of assisting in its development from a membership of about 1400 to one of about 4000, at which figure it stood when he retired in 1916. His cultured manner and genial disposition endeared him to a large number of the members and others with whom he came in contact.

He had been in failing health for several years past, but his sudden end came as a great shock to all who had known him.

F. W. STREATFEILD.

The death of Frederick William Streatfeild, which occurred on March 24, has produced a sense of personal bereavement in a wide circle of British chemists and especially to those who have received any portion of their scientific training at the Technical College, Finsbury.

Streatfeild joined the staff of the College in 1883 and for many years took the main share of the responsibility for the laboratory training of the chemical students. He was, himself, an accomplished experimentalist with a remarkably ample fund of laboratory knowledge, the endowment of a life devoted to practical chemistry.

Before taking up teaching Streatfeild had been associated with Nevile and Winther in their researches on orientation in the aromatic series and in the work which led to the earliest preparation of the industrially important α-naphthol-4-sulphonic acid. He subsequently collaborated in chemical research with Professors Armstrong and Japp and with the late Professor Meldola. He was the author of a manual of practical organic chemistry, but it is greatly to be regretted that much of his highly specialised knowledge of this branch of chemistry was never published and has passed away with him.

Streatfeild, who was a singularly self-effacing man, was much attached to the arduous life he led at the College, where his loyal and self-sacrificing devotion, although it never brought him any adequate material recompense, certainly gained for him the affection and esteem of all who were privileged to be his pupils.

A heartfelt desire has already arisen spontaneously among his former colleagues and students to preserve the memory of his faithful services. To the last Streatfeild never forgot his students, and those of them who are able to realise the true value of his life's work will retain a grateful remembrance of him.

GILBERT T. MORGAN.

PUBLICATIONS RECEIVED.*

TREATISE ON APPLIED ANALYTICAL CHEMISTRY. *By* PROF. V. VILLAVECCHIA. *Translated by* T. H. POPE. *Pp.* 475. (*London: J. and A. Churchill.*) *Price* 21*s*.*

STANDARD METHODS OF CHEMICAL ANALYSIS. *Edited by* W. W. SCOTT. *Pp.* 864. (*New York: D. Van Nostrand Co.*) (*London: Crosby Lockwood and Son.*) *Price* 30*s*.

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. *Edited by* W. A. DAVIS. *Pp.* 836. *Fourth Edition entirely re-written. Vol. IX. Supplement and General Index.* (*London: J. and A. Churchill.*) *Price* 22*s*.

TRATTATO DI CHIMICA GENERALE ED APPLICATA. ALL'INDUSTRIA, *Vol.* I. *Chimica Inorganica. Parte Prima. Pp.* 560. (*Milano: Ulrico Hoepli,* 1918.)

REAGENTS AND REACTIONS. *By* E. TOGNOLI. *Translated by* C. A. MITCHELL. *Pp.* 228. (*London: J. and A. Churchill.*) *Price* 6*s*.

THE CHEMISTRY OF LINSEED OIL. *By* J. NEWTON FRIEND. (*Chemical Monographs, edited by* A. C. CUMMING.) *Pp.* 96. (*London: Gurney and Jackson.*) *Price* 2*s*. 6*d*.

FUEL. *By* J. S. S. BRAME. *Second Edition,* 1917. *Pp.* 372. (*London: Edward Arnold.*) *Price* 15*s*.

L'ENSEIGNEMENT DE LA CHIMIE INDUSTRIELLE EN FRANCE. *By* E. GRANDMOUGIN. *Pp.* 180. (*Paris: H. Dunod et E. Pinat.*) *Price* 3 *fr*. 50.

GLASS. *By* P. MARSON. *Pp.* 122. (*London: Sir Isaac Pitman and Sons, Ltd.*) *Price* 2*s*.

CATALOGUE OF RARE AND STANDARD BOOKS ON EXACT AND APPLIED SCIENCE. *Pp.* 248. (*London: H. Sotheran and Co.*) *Price* 2*s*. 6*d*.

ELEMENTS OF INDUSTRIAL CHEMISTRY. *By* ALLEN ROGERS. *An abridgement of "Manual of Industrial Chemistry." Pp.* 513. 117 *illustrations.* (*London: Constable and Co., Ltd.*) *Price* 12*s*. 6*d*.

WHAT INDUSTRY OWES TO CHEMICAL SCIENCE. *By* R. B. PILCHER AND F. BUTLER-JONES, *with an Introduction by* SIR GEORGE BEILBY. *Pp.* 150. (*London: Constable and Co., Ltd.*) *Price* 3*s*.

ANNUAL REPORT OF THE U.S. NATIONAL MUSEUM, 1916. *By* RICHARD RATHBUN. *Pp.* 219. (*Washington: Government Printing Office.*)

THE DESIGN AND CONSTRUCTION OF INDUSTRIAL BUILDINGS. *By* MORITZ KAHN. 62 *Illustrations.* (*London: Technical Journals, Ltd.*)

COAL TAR DISTILLATION. *By* ARTHUR R. WARNES. *Second Edition. Pp.* xxxii. + 303. (*London: "The Gas World" Offices,* 1917. *Price* 10*s*. 6*d*.

CHEMISTRY FOR BEGINNERS. *By* C. T. KINGZETT *Second Edition. Pp.* 150. (*London: Baillière, Tindall and Cox.*) *Price* 2*s*. 6*d*.

* Unless otherwise stated all prices given are net prices.

REVIEW.

Coal Tar Distillation. *By* Arthur R. Warnes, *Second Edition. Pp.* xxxii. + 303. (*London: "The Gas World" Offices*, 1917.) *Price: 10s. 6d. net.*

Owing to the greatly increased importance assumed by coal tar products and to the wider interest taken in the subject, especially by the gas industry, it is not surprising that a second edition of this excellent manual should have made its appearance. While there is but little alteration in the text, the author has taken the opportunity of amplifying the treatment of matters that are of special importance at the present time, and of bringing information up to date where necessary. The book is of an eminently practical nature, and is not clogged with descriptions of obsolete plant and process s. The author is probably best known in the industry by the valuable investigations he has carried out in connexion with the corrosion of tar stills, and he has applied the results of his work to the design of stills and their mountings. Under the Leading of Coal Tar, additional attention has been paid to tars produced by carbonisation of coal in vertical retorts and at low temperatures. Continuous processes of distillation and of dehydration are fully described and well illustrated, but the Lennard still has received very scanty attention, though it is possible that more tar is treated by this than by any other continuous process. Modern developments in the preparation of tar for road work are indicated, and the requirements of the Road Board are detailed and criticised. In the section on Phenols, the new continuous processes of creosote washing are well outlined with the aid of diagrams.

In the chapter devoted to Naphthas, the recent patent, covering the washing of benzols by passage of the vapours through a bath of hot acid, is mentioned. It would be of interest to know the loss, if any, by sulphonation of the aromatic hydrocarbons. Horizontal benzol stills are described with but one manhole, but there is great advantage, in the case of steam-heated stills, in having two, one at each end of the still, one being as low and the other as high as possible. By this means the time required for cooling and sweetening the still, prior to cleaning and repairs, can be very considerably shortened. The chapters on Pyridine bases are fuller than in the earlier edition, while, in the section on Creosote, more attention is given to the use of tar oils as fuel. Exception must be taken to the contention that the only oils suitable for this purpose are such as do not deposit solid hydrocarbons. "Salty" creosote is regularly and abundantly employed as fuel, being fed through steam-jacketed pipes to atomising burners. On page 191 the flash-point of creosote is given as between 150° and 210° C. These should be F°. Increased space is devoted to the application of tar oils as germicides. The chapter on Pitch deals with the subject of "pitch cancer," recent work being recorded, but no information is given as to the effectiveness of the several patented processes that have been devised with the purpose of obviating this trouble.

A new chapter appears wherein processes for the recovery of benzol from coal gas are fully treated. Theoretical considerations are also discussed, but objection must here be made to the use of the term "degree of saturation" for indicating the benzol content of the wash oils. The "C" process for scrubbing gas with crude tar is referred to in some detail, and comparison is made between this and the process for "stripping" by oils. Unfortunately such comparison has so frequently been made, that it is as well to recall that the "C" process resulted from a very urgent demand for toluene; and that the process is capable of doubling, and in many cases trebling, the output of this hydrocarbon, at the same time making use only of plant already installed at the gasworks, and so avoiding the very serious delay that must have occurred while awaiting the erection of stripping and recovery plant. It seems obvious that the "C" process could not rival that of "stripping" by oil, and, as it was not devised with that object, comparisons are out of place.

We consider that the author introduces an element of risk in not insisting on the provision of safety valves for all stills; also in advising the collection of distillates, especially benzols, in drums and other small vessels; and, further, in suggesting a wooden staging to the pyridine plant. Wooden stagings should never be a permanency in tar distilleries or any other works where inflammables are handled.

The chapter on laboratory work is extremely useful, and has been enlarged by the introduction of matters relating to recent developments of the industry. It is surprising to see a method of testing tar for water described as "quick" that requires 45 minutes. The Höchst test for anthracene cannot be regarded as correctly reproduced. It seems a pity that opportunity has not been taken to suggest the standardisation of many of the methods of testing. For example, the Young still-head (12-bulb) is now being very largely used, and it might advantageously be regarded as the standard fractionating column. As a matter of fact the author does himself deplore the lamentable lack of standardisation in creosote testing, and efforts should certainly be made by coal tar chemists to secure uniformity of practice in the examination of this and other coal tar products. In the present edition a number of corrections have been made, though there are still some outstanding errors; but probably these will be dealt with in the third edition which, we feel confident, will surely be forthcoming in the near future if the present edition meets with that demand which its value and its merits justify. The work of the publishers is up to the high standard expected of them, the illustrations being very well done, the type clear, and the misprints very few.

Hugh W. James.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Inducheme, Finsquare, London.*]

THE WORLD'S COAL RESOURCES—DISTORTED STATISTICS.

H. LOUIS.

In a pseudo-scientific work recently published in Germany,* there appears a statistical review of the coal resources of the world, which is written obviously for the encouragement of Germans and possibly of neutrals. The statistics given in this book are familiar, seeing that they have all been taken from the 1913 Report upon the coal resources of the world, issued under the auspices of the 12th International Geological Congress in Canada; there are a few additional statistics concerning the coal output of Germany and countries in German occupation since the war, as to the accuracy of which there are no means of judging.

The author has taken the statistics in the Report above referred to and has simply distorted them to suit the ends he had in view. A few examples of the more prominent inaccuracies will show the line that he has followed.

He repeatedly makes the statement that the British statistics have been drawn up by the mining engineers in the employ of the colliery companies, whose duty it has been to place the amount of their respective coal resources in the most favourable possible light, whereas German statistics have been drawn up by officials of the Mining Department, and on these grounds he insists that the statistics given for British coal resources are far higher than they should be, compared to the German figures. As a matter of fact exactly the opposite is the case: in the first place the mining engineers he refers to are employed by colliery companies which only in quite exceptional cases own the coal, so that the quantity of available coal resources is a matter of supreme indifference to the collieries, which only hold leases of the coal areas for relatively limited periods; furthermore, the British statistics have been drawn up, not by these engineers, but by the absolutely independent authorities of our Geological Survey; German statistics, on the other hand, have been drawn up by engineers of the German State Mining Department, the State in this case being the actual coal proprietor; if therefore there is any basis for the suggestion that either party has exaggerated the coal supplies of their nation, it would obviously be to the interest of the German and not the British Authorities to have done so.

The author makes a statement that sinking in Britain through water-bearing strata was only possible by means of the freezing process, which could be carried out only by German engineers, and that in England all complicated technical operations were entrusted to the more highly developed technology of Germany, since "West European culture" has shown itself to be incapable of dealing with them. The facts are that for sinking in heavily-watered strata German collieries had originally to call in the assistance of British mining engineers, until the freezing process (first devised in this country) was ultimately brought to a high pitch of perfection in Germany. The author conveniently omits to mention the fact that this freezing process has in recent years been almost entirely supplanted by the cementation process, which is French in its origin and has been highly developed in this country, so that his statement is distinctly untrue.

In several passages the author lays stress on the necessity for France to buy back from Germany the Northern French coalfields now in German possession, and has the audacity to value this coal *in situ* at 8 marks per ton; it is, however, well known that British coal, admittedly higher in quality than the French coal in question, is worth on the average 6d. per ton in the unsevered condition, this being the average amount of the royalties paid for it. Furthermore, he calculates the value as though the price of the unsevered coal could be realised forthwith, and conveniently forgets that the purchase price could only be the present value of the price realised by such coal as and when extracted; obviously the present value of coal to be raised a century hence is a relatively insignificant amount.

In order to depreciate the value of the coal resources of our British Colonies, he makes use of such arguments as the following:—"The impression is gained that the classification of coal of the Canadian Commission had only been adopted in order to conceal the inferior quality of the Western lignite under the veil of unintelligible formulas"; and he further suggests that the small output of Canadian coals is evidence of their poor quality.

The conclusions that he desires to impress upon his readers are that England has coal for two, or at the outside three, centuries, Germany for 1500 years, and that, from the point of view of a German coal policy, the possession of Belgium is indispensable to Germany.

*Die Kohlenvorräte der Welt. By Geh. Bergrat Prof. Dr. F. Frech, Breslau. (Stuttgart: Ferd. Enke, 1917.) Price; 7 marks.

ORIGIN OF THE OXYGEN COMPOUNDS FOUND IN STEEL.*

COSMO JOHNS.

It has long been known that both solid and gaseous oxygen compounds occur in steel and that by appropriate methods they can be isolated and their composition and ratios determined. The literature of the subject is already very extensive; reviews of current theories with bibliographies may be found in the writings† of Levy, Baker, Pickard, Donaldson, Stead, and McCance, to mention only a few of the most accessible. The solid compounds are substantially oxides of silicon, manganese and iron, though under certain well-defined conditions the oxides of aluminium and other metals may be found. The gaseous compounds are the oxides of carbon, both carbonmonoxide and dioxide being present. The occurrence of the solid compounds in the form of silicates has been attributed to (A) the entrapping of particles of slag; (B) the mechanical enclosure of silicate particles from tapholes, ladle linings, etc., during casting operations; (C) the partial solubility of slags in the steel and the retention of particles during solidification; (D) reaction between oxide of iron and the silicon and manganese present in the steel. The gaseous oxygen compounds are generally regarded as due to the absorption of the furnace gases by the liquid steel in common with the other gases, such as hydrogen and nitrogen, which are found associated with the oxides of carbon; but in discussions as to the origin of these gases the oxygen compounds are not differentiated from the other gases present. That the presence of silicon and manganese favours the solubility of the gases and prevents their liberation during the cooling of the liquid steel, with the consequent formation of blow-holes, is a widely-held opinion.

In this short communication it is proposed to suggest a working hypothesis which will explain the origin of all the oxygen compounds found in steel, whether as silicate inclusions, occluded gases or the gaseous contents of blow-holes, while leaving a more detailed discussion for another occasion.

* Received April 15, 1918.

† Carnegie Scholarship Memoirs, Iron and Steel Institute 1911, 1913, 1916. Journal, West of Scotland Iron and Steel Institute, 1917.

A typical analysis of the silicate inclusions would be SiO_2 55%, MnO 40%, FeO 5%, but the variations from this ratio are considerable. The oxides of carbon found among the gaseous constituents are characterised by the marked predominance of CO and the constant occurrence of CO_2 in small amounts. A typical analysis of the "occluded" gases found in steel would be CO_2 1·4%, CO 43%, H 0·55%, CH_4 0·30%, N 0·30%. Now the more oxidising the conditions under which the steel was made the larger will be the total amount of oxygen compounds, solid or gaseous, found. The ratio of solid to gaseous compounds depends on the particular type of steel under investigation, but with any one type of steel an increased volume of gases is attended generally by an increase in the solid oxygen compounds and the increased volume of gases is found to be in great measure if not entirely due to an increase in the oxides of carbon. The solid and gaseous oxygen compounds thus bear a direct relation to the conditions attending the manufacture of the steel, and this strongly suggests a common mode of origin.

Differences of opinion exist as to the solubility of oxide of iron in liquid steel but the weight of probability is in favour of its limited solubility. Pickard's work strongly suggests this, and the occurrence of oxide of iron at the junction of the crystals in over-oxidised Bessemer steel supports this view; an analogous case being the system CuO—Cu with its well-marked eutectic. The partial solubility of iron oxide in liquid steel is therefore postulated in the hypothesis which follows. Iron oxide, whether as FeO or as a lower oxide is not material to the discussion, being partially soluble in liquid steel, would, during solidification, be thrown out of solution and tend to concentrate near the growing crystals if the assumption made be admitted. In steel we have silicon and manganese present, both forming solid solutions with iron up to and beyond any proportions found in practice. Taking a typical steel containing silicon and manganese with some iron oxide in solution we have only to consider the two variables, temperature and concentration. At some definite temperature above the melting point of the steel the silicon, manganese and iron oxide would be, and remain, in equilibrium if no disturbing influences were introduced, as a result of reactions that had previously taken place and the products of which had been removed by gravity. Now when cooling below the freezing point takes place the iron oxide, falling out of solution as the temperature diminishes, would become concentrated in the regions adjacent to the growing crystals and equilibrium would no longer exist for both temperature and concentration has varied. The concentrated iron oxide would react with the dissolved silicon and manganese and mixed silicates of iron and manganese would be formed. The ratio of the iron, manganese and silicon would be determined by their respective mass and their affinity for oxygen. Solidification would have proceeded so far that the silicates would remain in the regions where the iron oxide had been originally concentrated.

But the presence of carbon in the steel would also involve its oxidation by the concentrated iron oxide and the gaseous oxygen compounds would form. In the presence of iron at high temperatures, CO must predominate and equilibrium would be established with a definite CO—CO_2 ratio. Both CO and CO_2 must be present, for neither CO nor CO_2 alone can be in equilibrium with iron at a high temperature. The conditions that would determine whether the formation of solid or gaseous reaction products would be favoured are somewhat complex. With steels low in silicon and manganese a gaseous product would tend to appear and blow-holes would result. If sufficient silicon and manganese be present a solid product would certainly be formed but the formation of the oxides of carbon would not be inhibited though their appearance might be delayed until solidification had proceeded so far that blow-holes would be prevented and the gases would be retained either in solution, or as gaseous inclusions under high pressure, at the boundaries of the crystals.

The postulation of the partial solubility of iron oxide in molten iron or steel thus affords a working hypothesis which explains the known facts relating to the occurrence of oxygen compounds in steel, is not repugnant to reason and offers a promising basis for further research. That the hypothesis now put forward is the only one that explains the occurrence of silicates is not contended; it is not the only one that affords an explanation of the gaseous oxygen compounds but it does possess the merit of explaining the known facts relating to the occurrence of the silicates and of the oxides of carbon, whether "occluded" or existing as the contents of blow-holes, and also brings these facts into definite relationship with the manufacturing conditions that are known to favour their appearance.

FIELD EXPERIMENTS WITH NITRATE OF AMMONIA.

J. HENDRICK.

For about ten years before the war, series of field experiments with new nitrogenous manures prepared synthetically from the nitrogen of the atmosphere were carried out in the north-east of Scotland under the auspices of the North of Scotland College of Agriculture. As it was found that nitrate of ammonia was being produced in quantity in Norway and elsewhere, and there was reason to suppose that it might at a not distant date be produced in such quantities as to become available for agricultural use, samples were obtained and experiments carried out during the years 1911 to 1914 in order to compare it with other manures. Field experiments were conducted on the College Farm of Craibstone and at other farms in the surrounding country. The crops experimented upon were hay and oats, as these are extensively grown in the district, and respond readily to the application of nitrogenous manures.

The general plan of experiment was to have (1) a plot or plots which received no manure; (2) a plot which received a dressing of superphosphate and a potash manure to show how much increase could be obtained by the use of these without any nitrogenous manure; and (3) a series of plots each of which received superphosphate and a potash manure as in (2), and in addition a nitrogenous manure, a different nitrogenous manure being applied to each plot in such quantity that all received nitrogen at the same rate per acre. This ensured that the crops to which nitrogenous manures were applied were not limited by want of phosphate and potash, and the difference between the crop on (2) and that on any plot in division (3) was presumably due to the effect of the nitrogenous manure used. As a rule, nitrate of soda was taken as the standard nitrogenous manure, and such quantities of the other manures were applied as would give an amount of nitrogen equal to that given by the standard dressing of nitrate of soda. The plots in section (3) then compared the effects of equal amounts of nitrogen applied in different forms of combination.

The nitrogenous manures used in these experiments were nitrate of ammonia, nitrate of soda, sulphate of ammonia, nitrate of lime and nitrolim

(commercial calcium cyanamide). though all of these manures were not used in every case.

Table I. shows results obtained on hay in twelve experiments carried on during four seasons.

Without the phosphate and potash considerable increases of crop were given by all the nitrogenous manures. Both at Craibstone and Balmain, sulphate of ammonia, which was used in these

TABLE I.

Hay Results per Acre.

Year	1911.	1912.	1913.	1914.	General Average.
No. of experiments averaged.	4.	2.	3.	3.	
Plot.	cwts.	cwts.	cwts.	cwts.	cwts.
1. No manure	36·3	33·0	49·8	49·6	42·4
2. Superphosphate and potash salt only	39·8	35·5	65·7	58·4	50·2
3. Same as No. 2, and nitrate of soda	43·5	45·0	69·2	57·8	53·8
4. Same as No. 2, and sulphate of ammonia	—	—	68·0	57·8	—
5. Same as No. 2, and nitrate of ammonia	47·0	49·0	69·7	59·9	56·2
6. Same as No. 2, and nitrate of lime	41·8	47·5	68·2	60·1	53·9
7. Same as No. 2, and calcium cyanamide (nitrolim)	—	—	—	61·1	—
8. No manure	37·8	—	—	—	—

In 1911 the four experiments from which the average for the year is taken, were carried out on four different farms. On one of these the soil was poor and thin, and the crop suffered severely from drought so that the return from all the plots was small, nevertheless a considerable increase of crop was obtained from all the nitrogenous manures. In another case the soil was good and in very high condition. In this case all the plots yielded over three tons of hay per acre, and little result was obtained from the application of any of the manures. With this exception considerable increases were obtained in all cases from the use of nitrogenous manures, and particularly from nitrate of ammonia. No sulphate of ammonia was used in this year. On each farm there were two "no manure" plots, but otherwise there were no duplicate plots. In every case the duplicate "no manure" plots, which were placed at the extreme ends of the series of plots, gave very similar results.

In 1912 the two sets of plots averaged were upon the same field on the farm of Balmain in Kincardineshire. The growing season was very dry and the crop was below the average for the farm. Large increases in crop were obtained in every case from the use of nitrogenous manures.

The standard dressing of nitrogenous manure in both 1911 and 1912 was 1 cwt. of nitrate of soda per acre.

The three series of plots averaged for 1913 were all beside one another upon a field on the College Experimental Farm of Craibstone. A large increase of crop was obtained on plot 2 for the use of superphosphate and muriate of potash alone, and the further increases obtained from any of the nitrogenous manures were small. The standard dressing of nitrogenous manure in this year was 1½ cwt. nitrate of soda per acre.

Alongside these plots two other series were manured with the same amounts of nitrogenous manures, but with no phosphate and potash. A similar experiment was carried out at the farm of Balmain in Kincardineshire. The results are shown in Table II.

TABLE II.

1913. *Hay. Results per Acre.*

Plot.	Place of experiment.	Craibstone.	Balmain.	General average
	No. of experiments averaged	2.	1.	
		cwt.	cwt.	cwt.
1.	No manure	51·1	55·0	52·4
2.	Nitrate of soda	61·2	62·5	61·6
3.	Sulphate of ammonia	56·6	57·5	56·9
4.	Nitrate of ammonia	60·8	60·0	60·5
5.	Nitrate of lime	59·1	60·0	59·4

experiments for the first time in 1913, gave a poorer result than the other nitrogenous manures. The season was a good one in this district, with sufficient moisture for a full hay crop.

In 1914 the experiment was carried out only upon the College Experimental Farm at Craibstone, and was in triplicate. Both sulphate of ammonia and nitrolim were used in this season, and the standard dressing of nitrogenous manure was, as in 1911 and 1912, 1 cwt. of nitrate of soda per acre. As in 1913 on this farm, the soil of which is in good condition, only small increases of crop were obtained when nitrogenous manures were added to phosphate and potash. The results in this year were very irregular, as the hay was made under bad conditions. The weather at haymaking was bad, and it was found impossible to get the hay in good condition before weighing, so that the results taken by themselves are not of great value.

Experiments with oats were made in the years 1911 and 1914 only. The average weights of grain obtained from the different plots in these two years are shown in Table III.

TABLE III.

Oats. Weight of Grain per Acre.

Plot.	Year	1911.	1914.	General average.
	No. of experiments averaged	5.	3.	
		lb.	lb.	lb.
1.	No manure	2307	1813	2122
2.	Superphosphate and potash salt only	2477	1853	2243
3.	Same as No. 2, and nitrate of soda	2644	2280	2507
4.	Same as No. 2, and sulphate of ammonia	—	1893	—
5.	Same as No. 2, and nitrate of ammonia	2787	2427	2652
6.	Same as No. 2, and nitrate of lime	2694	2320	2554
7.	Same as No. 2, and calcium cyanamide (nitrolim)	—	2413	—
8.	No manure	2307	—	—

There were five sets of plots in 1911, duplicates on the farm of Craibstone and single sets of plots on three other farms. On one of these the soil was in such good condition that little increase was obtained from the use of any of the manures. In all other cases very distinct results were obtained from the use of all the nitrogenous manures. Although the average results of the two "no manure" plots are exactly the same, in none of the five individual sets of plots did the two unmanured plots give the same result. The weight of grain given is the total grain threshed, including the light grain. The standard dressing

of nitrogenous manure was 1 cwt. of nitrate of soda per acre.

In 1914 the experiment was carried out in triplicate on a field of "lea" oats on the farm of Craibstone. The standard dressing was again 1 cwt. of nitrate of soda per acre. With the exception of sulphate of ammonia all the nitrogenous manures gave large increases of crop. The failure of sulphate of ammonia must be looked upon as due to accidental causes, as in many other experiments it has given good results on this farm.

The general result of all these series of field experiments is to show that nitrate of ammonia may be expected to give, at least as great increases of crop, weight for weight of nitrogen, as any of the other concentrated nitrogenous manures in use. Both in the experiments upon hay and upon oats, nitrate of ammonia gives on the average the best results, but it would not be wise to insist too much upon this. As is usual in experiments carried out under field conditions large variations due to accidental causes or causes not under control were found among duplicate plots; and though it is remarkable that the nitrate of ammonia plots should happen to come out best in all the averages, further experiment may show that this result is not significant, but merely due to accidental causes. If it is confirmed that nitrogen in nitrate of ammonia is more effective as a fertiliser than an equal weight of nitrogen in nitrate of soda, nitrate of lime, or sulphate of ammonia, it will be necessary to seek for an explanation of such an unexpected result.

The nitrate of ammonia used in these experiments was nearly pure. Samples were analysed in each year, and the nitrogen content was found to vary from 34·4 to 34·8 per cent. Pure ammonium nitrate contains 35 per cent. of nitrogen.

The nitrate of lime used contained from 13·3 to 13·5 per cent. of nitrogen, and the nitrolim (calcium cyanamide) used in 1914 contained 15·7 per cent. of nitrogen. The nitrate of soda, sulphate of ammonia, and other manures used were of ordinary standard commercial quality.

The nitrate of ammonia used in 1911, 1912, and 1914, and the nitrate of lime used in all four years, 1911 to 1914, were supplied by the Norwegian Hydro-Electric Company, Ltd., through Mr. J. J. Beer, who was then the representative of the company in London. The nitrate of ammonia used in 1913 and the nitrolim used in 1914 were supplied by Mr. W. Millner, Nitrogen Fertilisers, Ltd., London. The nitrate of ammonia supplied by Mr. Millner came from Villevord in Belgium. My thanks are due to Mr. Beer and Mr. Millner for supplying me with these manures.

Nitrate of ammonia, like nitrate of lime, is hygroscopic, and this property places it at a serious disadvantage in competition with sulphate of ammonia and nitrate of soda. If left freely exposed to the air it rapidly becomes damp and liquefies. It cannot therefore be stored in manure stores or farm buildings in bags. Some trials were made of mixtures of nitrate of ammonia with superphosphate and other manures. It was found that such mixtures are wet and pasty. Obviously also nitrate of ammonia cannot be used in admixture with an alkaline manure like basic slag. Its use, therefore, as a constituent of mixed manures will be almost excluded. This will handicap it seriously as compared with sulphate of ammonia. A large part of the concentrated manure used by farmers is purchased in the form of mixed manures. At present sulphate of ammonia is very largely used in making mixtures containing soluble phosphate, and it seems as though nitrate of ammonia would not be able to compete with it for this purpose.

THE TRADE NUMBERS OF VINEGAR.

C. A. MITCHELL.

It has long been a custom of the vinegar industry to distinguish different grades of vinegar by numbers, the strongest being termed No. 24 and the lower strengths as Nos. 22, 20, 18 or 16. The origin of these "trade numbers" is obscure, but they probably date back to the early part of the 18th century, when vinegar brewing had become well established as a separate industry. The question has more than historic interest, however, as is shown by the fact that recently a solicitor put forward the suggestion that the description of a vinegar by its trade number on an invoice was equivalent to a warranty that it was of a certain strength. This suggestion was the logical conclusion from the commonly accepted belief that these numbers represent the number of grains of anhydrous sodium carbonate required to neutralise one fluid ounce of the vinegar. This view appears to have originated with Muspratt ("Dictionary of Chemistry," 1860, p. 32), and has since been copied from that source into various text-books and dictionaries. According to this explanation the acetic strengths of the various grades of vinegar would be as follows:—Nos. 16 = 4·1; 18 = 4·6; 20 = 5·16; 22 = 5·6; and 24 = 6·2%.

Both the tradition of the industry and the earlier printed evidence point to a different origin for these numbers. In the Revenue Act of George III. (1818) *proof* vinegar is defined as "containing such strength of acetous acid that 100 parts of the liquor by weight shall saturate or neutralise 14½ parts by weight of crystallised subcarbonate of soda." This salt corresponded with the modern sodium carbonate $Na_2CO_3 + 10H_2O$, and on the basis of this requirement proof vinegar contained 4·74 % of the hypothetical "real" or "dry" acetic acid (acetic anhydride), or 5·5 % of hydrogen acetate. The Excise officers determined the strength by neutralising the vinegar with lime and testing the calcium acetate solution with a special hydrometer termed an "acetometer." In Nicholson's "Dictionary of Chemistry" (1823), p. 10, it is stated that this acetometer was based on the strength of "Revenue proof acid called by the manufacturer No. 24." This proves that at that time 24 vinegar certainly did not contain the 6·2 % of acetic acid required by Muspratt's explanation. This is also borne out by Phillip's "Translation of the Pharmacopœia" for 1824 (p. 16), which states that "the strongest malt vinegar is termed *proof vinegar*, and by the manufacturer called No. 24. It is estimated to contain 5% of real acetic acid." To comply with Muspratt's explanation it would have had to contain 5·27 % of acetic acid.

The true explanation of the origin of the trade numbers appears to be that they indicated the price at which a gallon of the vinegar was sold. The "Penny Magazine," 1842, p. 430, in giving this explanation, remarks, "Although the price no longer accords with these numbers, the numbers themselves have been retained as symbols whereby a certain quality of vinegar may be known and designated." The same explanation is given by Tomlinson, "Cyclopædia of Useful Arts," 1854, p. 7. The terms "24 vinegar," etc., would thus be analogous with the "six ale" of the brewery, a popular contraction of the "six shilling ale" of the Revenue Act of Charles II.

This explanation is also in accord with the practice of vinegar makers who have never sold the vinegars at recognised acetic strengths. For example, 16 vinegar has been sold by the different makers at strengths ranging from 3·5 to 5%, and 24 vinegar at strengths of about 5·2 to 6%. In

fact, the writer, during an experience of many years, has never met with a sample of commercial 24 vinegar which contained as much as 6·2 % of acetic acid.

NEWS FROM THE SECTIONS.

MANCHESTER.

The annual general meeting was held on April 12. Mr. W. Thomson was in the chair, and there was a record attendance of about 160 members. Messrs. J. Allan, S. E. Melling, E. Ardern, and Dr. T. Callan were elected ordinary members of the Committee in the place of retiring members not eligible for re-election. It was unanimously resolved that Rule 3 be altered to the effect that the chairman should hold office for two years in succession, and then be ineligible for re-election as chairman, but still be eligible for election as vice-chairman for a period of two years from his retirement.

In connexion with the British Association of Chemists, Dr. Forster announced that there was to be held within the near future a mass meeting of Manchester chemists, followed by a mass meeting of chemists for the whole of the country. Eleven local sections had been formed with probably 200 members in each, every important town in the country having participated in the movement. It was hoped that the Association and the Institute would soon be able to issue a Joint Report concerning their proposed procedure. It was imperative that the new organisation should receive the whole-hearted support of all chemists throughout the country. A policy of masterly inactivity could not be too strongly deprecated.

At the conclusion of the annual meeting, Mr. J. Reavell read a paper entitled, "Evaporation in the Chemical Industry, with particular reference to the Kestner Film Evaporator."

After giving a preliminary sketch of early progress in methods of evaporation, the author proceeded to an examination of the laws of heat transfer, and then to a detailed description of their application in the Kestner Film Evaporator. The conditions governing the quantity of liquor evaporated in a tubular apparatus heated by steam were enumerated, and the fact that increased steam pressure did not necessarily involve proportionally greater evaporation, was emphasised. High temperatures could be used with advantage in a film evaporator, because the surface was so disposed that the diameter was small. If high temperature, and consequently high pressure, were employed in a vacuum pan many liquids which were sensitive to heat were destroyed owing to lengthened contact with the heating surface; but with a film evaporator the contact was extremely short. An advantage of the vertical climbing film evaporator was the small number and the great length of the tubes; ; the circulation attained a high velocity and thus ensured a high degree of heat transmission and practically momentary contact. With a Kestner film evaporator the area of steam space was small, the speed of the steam was high and the gases were collected in a definite place whence they could be removed easily and completely. The high speed of the liquor, moreover, tended to reduce scaling. The climbing film tube made possible a perfect separation of liquor and vapour.

Many additional advantages of the continuous film evaporator were fully dealt with, not least among which was the ability to concentrate liquors up to very high densities and in some cases to commercial dryness. Owing to high solubility some inorganic liquors, *e.g.*, ammonium nitrate, could be concentrated to very high densities (85 per cent. solid) without precipitation of crystals.

The Kestner salting type evaporator was of great utility in dealing with solutions containing two salts, one of which, owing to its lower solubility, could be precipitated while the other remained in solution.

YORKSHIRE.

The annual general meeting of the Yorkshire Section was held at Leeds on April 15, under the presidency, first, of Mr. S. H. Davies, and afterwards of Mr. W. McD. Mackey, vice-chairman (Professor J. W. Cobb, the chairman, being unavoidedly absent). The nominations for official positions and for the committee were as follows, and all were unanimously elected :—Chairman, Mr. W. McD. Mackey; vice-chairman, Mr. S. H. Davies; hon. secretary and treasurer, Mr. T. Fairley; committee, Mr. G. H. Frank, Dr. Lloyd, Mr. W. Lowson and Professor Perkin.)

On behalf of Mr. Fairley and himself, three interesting notes were submitted by Mr. B. A. Burrell. The first, "On the Presence of Bismuth in the Human Brain," dealt with an investigation in the case of a man in middle life whose death was suspected to be due to slow poisoning. During an illness of some months the man had taken considerable quantities of preparations of bismuth, medically prescribed, and not only was the element found in the abdominal organs, but there were also distinct evidences of it in the brain. The authors had not been able to find any similar recorded instance, and it was an interesting speculation as to what action the metal would have on the brain substance, and therefore on the mental condition of those taking this widely used drug. According to Martindale and Westcott (1895 ed.), bismuth entered into no fewer than 1112 recognised prescriptions.

The second note advocated the use of copper gauze (100 meshes to the linear inch) instead of fine linen for the purpose of filtration in the estimation of woody fibre, or, as it is sometimes called, crude fibre, in cattle feeding stuffs. It was submitted that the mesh of "fine linen" may be widely variable, so as to preclude comparable results, and that the filtering medium in such investigations is of hardly less importance than the strength of the acid and alkali used. In common with the large majority of chemists, as they believed, the authors used acid and alkali of 1·25 % strength, as against the 2 % recommended by Messrs. Voelcker in the January number of the *Analyst*.

"The Estimation of Sugar in War Flour and Bread" was the subject of the third note, based upon the results of a number of experiments in the early part of last year, when analysts were confronted by a collection of difficulties introduced by the Cake and Pastry Order. One of the provisions of the Order was that "No scone shall contain any sugar." This seemed to imply that those responsible for the Order neglected the fact that sugar is a normal constituent of wheat, barley, maize, oats, rice or rye flour, and no directions were given for any allowance in respect of sugar naturally present. No information was available as to the quantity of sugar present in war flour and bread, and in order to obtain this the authors submitted a number of samples to both aqueous and alcoholic extraction, and to the usual subsequent tests. Cold aqueous extract of two war flours contained a reducing sugar calculated as invert sugar, 1·9 % and 2·1 % respectively, and total reducing substances after inversion, reckoned as cane sugar, 4·4 % and 4·3 %, while the cold alcoholic (70 %) extracts gave a like total sugar as cane sugar 1·5 %. Bread made from the same flours under their own supervision gave the following results :—Cold aqueous extract, reducing sugar calculated as invert sugar, 2·3 % and 1·2 % respectively;

total reducing bodies after inversion, reckoned as cane sugar, 7·2 and 7·9%; cold 70% alcoholic extract, total as cane sugar, 2·2 and 2·4%. It should be mentioned that the milling standard at the time was 87%, compared with 90% at present.

A short paper was read by Mr. F. W. Richardson, of Bradford, on "The Estimation of Minute Amounts of Iron by the Colour of its Hydrochloric Acid Solution."

This test, the author stated, is three times as sensitive as either the sodium ferrocyanide or ammonium sulphocyanate methods, and it is particularly applicable to the ready estimation of minute amounts of iron when mixed with alumina, as in the ash of flour or bread under examination for alum.

OFFICIAL NOTICES OF THE SOCIETY.

NEW VICE-PRESIDENT.

Mr. Thomas Fairley, of Leeds, Hon. Secretary of the Yorkshire Section, has been elected by the Council (under By-laws 21 and 32), a Vice-President of the Society to fill the vacancy caused by the appointment of Mr. David Lloyd Howard as Honorary Treasurer.

ANNUAL GENERAL MEETING, 1918.

In accordance with the provisions of By-law 61, notice is hereby given that the Annual General Meeting will be held in the University Buildings, Bristol, on Wednesday, July 17, 1918, at 10.30 a.m. The programme of the proceedings will be issued later.

In accordance with the provisions of By-law 24, those members whose names are printed in *italics* in the List of Council will retire from their respective offices at the forthcoming Annual Meeting.

Prof. Henry Louis has been nominated to the office of President, under By-law 20; Dr. E. F. Armstrong, Prof. W. R. Hodgkinson, Mr. R. L. Mond, and Mr. W. F. Reid have been nominated Vice-Presidents under By-law 21; and Mr. D. Lloyd Howard, and Dr. R. Messel, F.R.S., have been re-appointed Honorary Treasurer and Honorary Foreign Secretary respectively.

Members are requested to nominate on or before May 21 next, fit and proper persons to fill the four vacancies among the ordinary Members of Council. Forms for this purpose can be obtained from the Secretary of the Society.

By-law 23.—An ordinary Member of Council shall be nominated by ten or more members upon Form B in the Schedule, a copy of which form shall be furnished by the Secretary upon the written or verbal request of any member, but a member shall not be eligible to sign more than one such nomination form, and the member nominated shall sign the declaration set forth on the form.

A nomination shall be declared invalid by the Council if :—

(A) The member thereon nominated is disqualified for election, or ineligible to be elected, as provided by the By-laws.

(B) The nomination is not made on the authorised printed form or substantially not in the manner directed thereon.

(C) The nomination form is signed by less than ten members not disqualified or not ineligible to nominate as provided by the By-laws.

(D) The nomination form is not received before or upon the day appointed therefor.

(E) The member nominated has not signed the declaration printed upon the form.

A member whose nomination aforesaid is declared to be invalid, shall receive notice thereof from the Secretary, and shall not be submitted for election.

J. P. Longstaff,
Secretary.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF PUBLIC ANALYSTS.

At the meeting held on April 3, the first paper was read by Mr. W. R. Mummery on "The Determination of Phosphoric Acid in Bone and Blood Fertilisers."

The author has investigated Ullmann's method, which, with certain modifications described in the paper, provides a rapid and accurate gravimetric method for the estimation of total phosphate in bone and blood fertilisers. A few analyses were appended showing the distribution of phosphoric acid in various fertilisers of this class.

"The Deterioration of Lime on Keeping" was the subject of the next communication by Mr. S. A. Woodhead. The general results of his experiments showed that powdered lime, if protected from rain, and frequently turned, undergoes very marked change, much more so than the same lime, if heaped and exposed to the weather. Powdered lime, if heaped in the open, undergoes very little change, due to the protecting layer of carbonate formed on the surface of the heap.

Dr. J. Waddell then read a paper on "The Volumetric Determination of Barium and a Method of Separation of Barium and Strontium," wherein he described a method of determining barium which consists in precipitating it as chromate and titrating the iodine, liberated on adding potassium iodide, with thiosulphate. A modification of the process by means of which any strontium precipitated with the barium may be removed was also described.

In a communication on "Dog-Fish Liver Oil," Mr. A. Chaston Chapman gave the so-called analytical "constants" and a number of colour reactions of two specimens of oil he had prepared from a large number of livers of the common dog-fish (*squalus acanthias*). Finally, Messrs. E. R. Bolton and C. Revis contributed a "Note on the Estimation of Moisture in 'Acid Oils.'"

"Acid oils," particularly those derived from coconut or palm kernel oils, cannot be dried in a hot oven owing to loss of fatty acids. The authors described a method of drying them on a crimped coil of filter paper *in vacuo* over a dehydrating agent, and expressed the opinion that this method was more rapid and accurate than the usual practice of drying on sand.

THE SOCIETY OF ENGINEERS.

A paper entitled "A Survey of the Power By-Product Problem" was read before this Society by Mr. T. Roland Wollaston on April 8.

Alluding to the Interim Report of the Coal Conservation Committee (this J., 1918, 40 R), the author said that for like types of prime movers as, *e.g.*, the steam turbine and water tube boiler plant, large units lead to proportionate reduction in capital and labour charges, but this scarcely applies to internal combustion engines. Advocates of the gas engine have not had the same opportunities in this country as turbine specialists, but the gain in thermal efficiency by the gas engine, if it exists, has so far appeared to be counteracted by extra capital and maintenance charges involved. It would be interesting to know if the electrical station engineer's craving for large units does not arise wholly out of their lower capital and labour charges, as, so far as he is aware, it is as easy to get high thermal efficiency out of a 2000 K.W. unit as out of a 20,000 K.W. unit.

The Report states that the average price for the N.E. coast district is less than 0·5d. per unit, and seems to suggest that such a price would catch the whole power load of the country. Would it? Certainly many large works would welcome such

a price, either because their existing private plant is antiquated, or because, working as they must on a low load-factor, the highest thermal efficiency cannot help them much. The author has worked out running costs and equivalent electrical costs obtained in an ordinary Lancashire weaving shed (the basic figures being actual ones taken from a log book in 1911), the plant comprising a 750 I.H.P. horizontal compound condensing engine, two Lancashire boilers with Green's economisers, no super-heat and rope drive. Taking the cost of coal at 14s. per ton, the cost per unit was 0·488d. and with coal at 18s., 0·543d. per unit. Revising the figures for the condition of, say, a flour mill working day and night, the costs in the two cases work out to 0·329d. and 0·378d. per unit. Contrasting the efficiency of gas firing with that of direct firing of coal to boilers, Mr. Wollaston said that gas firing has not yet had fair play, in that it has almost always been carried out in boilers specifically designed round coal grates and intended for direct firing.

Dealing with the fuel by-product problem, the author said that electrical engineers generally associate it with coke ovens and blast furnaces as in the N.E. coast enterprise, and that few seem to realise that when collieries and ironworks substitute electrical transmission for the uneconomical steam winding, haulage, pumping, etc., there will probably be no surplus gas from these sources for public supply. For power-supply purposes, by-products, important as they are, must always be secondary to the highest possible yield of B.Th.U., convertible into electrical energy from the fuel. The author has worked out estimates of gross receipts from one ton of coal consumed in the chief systems of gasifying coal (assumed to be of 12,000 B.Th.U. value per lb.). The gas yield is converted into electrical units on the basis that 1 electrical unit is equal to 20,000 B.Th.U., and that the fuel cost chargeable against the electrical unit is ⅙d. The prices of by-products are entered at reasonable rates and the figures of average yields were obtained from recognised authorities. By town's gas retorting, 4s. 2d.; by coke ovens, 2s.; by low temperature distillation with transference of coke to producers, 6s. 8d.; by the Mond system, 12s. 1d.; by a modification of the Mond system upon which he was working, 14s. 11d. In each of these cases there would be a rebate for by-products which was stated approximately. The equivalent value in electrical energy from one ton of coal by normal firing without by-products would be 18s. 8d. After referring to the criminal waste involved in leaving enormous residues in the coal mines (this J., 1916, 770), the author submitted eight conclusions, among which may be specified: the advisability of installing producer recovery gas plants in large electric stations, particularly for such which are needed in nitrogen fixation, electrolytic or metallurgical undertakings. Surplus gas arising from low temperature distillation of fuels rich in volatile products, from coke ovens and blast furnaces, should be used by electrical generating stations acting as feeders to a larger system. Town's gas systems should be adapted to produce higher yields of by-products and larger volumes of low-grade heating gas. The assumed demand for semi-coke or like smokeless fuel for domestic purposes is problematical.

ROYAL SOCIETY OF ARTS.

On April 10 Dr. W. L. Balls of the Fine Cotton Spinners' Association, addressed this Society on "Some Instances of Applied Science in the Cotton Trade," dealing mainly with applications of science to the cultivation of the cotton plant.

After describing his researches on the preparation, propagation and cultivation of pure strains of cotton plants, the lecturer explained the customary methods of gauging the length of staple, and then exhibited his new apparatus for effecting the same purpose in a more accurate and rapid manner. By a continuous cycle of repeated operations, the lint is automatically and rapidly fractionated into separate parcels of hairs of different length, those with the shortest hairs being delivered first, and the longest last.

Investigation of the cause of the repeated deterioration of the Egyptian cotton crops between 1898 and 1912, gave the positive result that it was due to the asphyxiation of the lower parts of the roots by the rise in level of the sub-soil water of the surrounding country, the rise being traced to the extension of the irrigation system.

By the aid of the graphical-statistical method, the author and his collaborators were successful in solving problems connected with root-function, with the effect of excessive temperature upon growth, the permeability of protoplasm in relation to temperature, and upon the economically important question of predetermination. (By pre-determination is understood such a question as, *e.g.*, why the hyacinth bulbs raised in Holland pre-determine a better show of bloom than those raised elsewhere.) They were further able to show that this factor must be taken into account at every turn in analysing the effects upon the growing plant of the "limiting factors" of the environment, and that it could be used to forecast the condition of a crop at a later stage of development.

To the short discussion which followed, Prof. W. Bateson, the chairman, and Messrs. C. F. Cross and Erwin W. Thompson, made interesting contributions.

THE OPTICAL SOCIETY.

At the meeting of the Optical Society, held at the Imperial College of Science, South Kensington, on April 11, the President, Prof. F. J. Cheshire, in the chair, a paper was read by Mr. J. W. French on the subject of "The Balsam Problem."

Canada balsam is almost invariably employed for cementing optical parts together, and there is no appreciably better substance known. The disadvantages of the various methods of combining optical parts were enumerated, the loss of light at transmission surfaces being particularly discussed.

The use of balsam and the present-day method of cementing were introduced more than 130 years ago by Abbé Rochon, and Grateloupe, assisted by the French optician Putois. Although far from perfect, the process has not been substantially improved since that time.

The source, composition and qualities of Canada balsam were described, with special reference to optical work. A considerable number of balsamed specimens of ages varying up to ten years had been opened, and photo-micrographs of the balsam layer were exhibited. In all cases fluid layers were found between the harder balsam and the glass surface, and the photographs showed clearly the imperfect adhesion to the glass.

Specimens artificially produced were also exhibited. In many cases the age of the specimen was shown to be deducible from the configuration. So-called granulation of balsam was stated to be due to the action of moisture on the balsam surface.

No trace of crystallisation of glass quality balsam was found in any of the experiments, but a number of the photographed specimens showed definite right-angled fractures such as are occasionally observed in torn gelatine films.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At a meeting of the Institution of Petroleum Technologists held on April 16, a paper on "The Relation between Viscosity and Chemical Constitution of Lubricating Oils" was read by Dr. A. E. Dunstan and Dr. F. B. Thole. The authors summarised the researches of previous workers on the subject and appended a full bibliography.

A method of determining the viscosity by a modified Ostwald apparatus was fully explained as well as the methods for calibrating the instrument. In addition, a method of de ermining lubricating value or oiliness of a lubricating oil to be used along with viscosity determinations was suggested, namely, the measurement of surface tension by the weight of a falling drop.

In discussing the relation of constitution to viscosity it was suggested that "viscosity must be largely a constitutive property and will be influenced considerably by molecular structure and arrangement."

Molecular volume also plays a part and heavy oils must be included in the category of isocolloids. As unsaturated hydrocarbons tend to associate into complexes, it is probable that this is the normat state of affairs in any lubricating oil. An ideal lubricating oil should therefore contain as large a proportion of unsaturated hydrocarbons as will not unduly effect oxidation, polymerisation and gumming. Figures were given showing the decrease in viscosity of various oils on treatment with sulphuric acid, *i.e.*, the removal of unsaturated hydrocarbons; and in all cases the viscosity of the residual oil gave lower figures.

The true lubricant is an unsaturated compound and possesses the following characteristic properties:—*viz.*, (1) Capacity to absorb iodine, bromine, oxygen and so on, (2) solubility in strong sulphuric acid, and (3) higher C/H ratio than the saturated derivative.

In opening the discussion, Sir Boverton Redwood, in the chair, stated that the time was ripe for the scientific treatment of lubrication and for the evolution of a scheme of physical and chemical tests which would give real assistance to the consumer in selecting an oil for his particular purpose, for which present-day tests were inadequate. It was inconsistent to devote attention to high fuel efficiency if means were not taken at the same time to reduce friction losses due to inefficient lubrication. He would like to ask the authors if their researches had given them any idea as to the reason for the high lubricating efficiency of sperm oil as against mineral oils.

Mr. Anfilogoff stated that mechanical testing appliances were not an unqualified success, pr.ctical conditions varied so widely, and viscosity was of no more than comparative value. Cylinder oil might be used both for steam engines and for internal combustion engines and was not necessarily suitable for both. Viscosity alone would not decide this, as this property was reduced to unit value with all oils at 230° C. Mixed oils were worse lubricants than straight run oil, and he suggested that in addition to viscosity tests, determinations should be made of boiling points and film stability. Professor Brame said that viscosity was not synonymous with body or oiliness and that determinations of viscosity in conjunction with surface tension should give good results as to body. He considered a good case had been made out for the unsaturated hydrocarbons, and as gumming was associated with unsaturation, possibly it might be a property of the more reactive ones, in which case removal of these by acid of less strength than usually employed would improve the resulting oil. Mr. Lomax advanced the view that the lubricating value of an oil is influenced by both the saturated and unsaturated hydrocarbons present. The unsaturated bodies can be extracted by liquid sulphur dioxide and their properties determined as well as those of the residual oil after this extraction. He quoted figures showing that while these unsaturated bodies possessed higher viscosities at low temperature than the saturated ones, yet the percentage fall in viscosity on increase of temperature was much greater. Mr. Wearham suggested the examination of an oil under pressure, in order to obtain data concerning the structure of the molecule and the effect of distortion. Mr. Butterfield quoted the effect of the addition of naphthalene, a crystalloid, in reducing the viscosity of tar oil.

PERSONALIA.

Mr. F. W. Atack has been appointed Director of the Wilton Research Laboratories, Manchester.

Mr. Kapilran H. Vakil, of Bombay, has accepted the appointment of Chief Consulting Chemist to the firm of Messrs. G. A. Tata, Sons and Co.

Mr. W. S. Glyn-Jones, M.P., Private Secretary to the Minister of Reconstruction, has been appointed Registrar and Secretary of the Pharmaceutical Society. The appointment is a part-time one.

The Willard Gibbs Gold Medal, presented annually by the Chicago Section of the American Chemical Society, was given this year to Dr. William M. Burton of the Standard Oil Co. He was the first to develop successfully the art of "cracking" petroleum, whereby the gasoline (petrol) product is vastly increased.

Textile Chemists and the B.A.C.—A provisional committee has been formed consisting of the chief chemists of representative associations and firms engaged in the textile and allied industries in order to watch the interests of chemists connected with these trades during the negotiations pending between the proposed British Association of Chemists and the Institute of Chemistry.

The services required of chemists occupied in these trades demand qualifications obtainable only from a training and experience supplementary to and broader than that provided in the ordinary teaching institutions, and it is felt that the interests of textile chemists will be prejudiced if too restricted and scholastic an interpretation be given to the title of "chemist."

It is the desire of the committee to secure the co-operation of all chemists associated with the textile and allied trades, and at a recent meeting it was decided to call a general meeting of textile chemists in the near future to discuss their position in relation to the proposed Association, and to reconstitute the committee on as broad and representative a basis as possible.

Any chemists who will communicate their names to the secretary (Mr. N. G. McCulloch, Rhod s Print Works, Rhodes, near Manchester) will be kept in touch with the movement, and the date of the meeting when fixed will be advertised in the press.

Tungsten in Portugal.—The Portuguese Department of Mines gives the following figures for the production of tungsten during the last three years:—1915, 860·7 tons; 1916, 1308·5 tons; and 1917, 1457·7 tons. The average grade of ore is 65 per cent.

NEWS AND NOTES.

CANADA.

There was an increase of 2800 acres under flax in the Middlesex and Lambton Counties of Ontario last year, the crop being valued at $693,000.

The year 1917 established a record for mining operations in the Province of Quebec, the production being valued at $16,051,188. In 1900 the value was $2,560,076; in 1906, $5,019,932; and in 1913, $13,119,811.

According to the figures for 1917, compiled by the Mines Branch of the Department of Public Works, the total output of Alberta Mines for the year was 4,863,414 tons, with 283 mines in operation. One copper mine was opened up on the main line of the Canadian Pacific Railway west of Banff and two shale mines are in operation at Red Cliff, near Medicine Hat. The total output of lignite for the year was 2,637,829 tons; of bituminous, 2,206,868 tons; anthracite, 118,718 tons; and briquettes, 93,818 tons. The total number of men employed in Alberta in the lignite field during the year 1917 was 5779 as compared with 5060 in 1916; in bituminous, 3746 as compared with 3234 in 1916, and in the anthracite, 287 in 1917 and 305 in 1916. The total number of men employed was 9812 in 1917 and 8599 in 1916.

* * *

The continued decline in the output of coal in Nova Scotia is a matter of grave concern for all industries depending on coal from that province. The output of Nova Scotia coal in 1913 was 7,263,485 long tons, but has been declining year by year till in 1917 it was only about 5,735,000 long tons. This is due partly to the failure of private capital to develop new mines, partly to the difficulty of getting new mining machinery, but chiefly to the diversion of labour from mining to the munitions plants. The serious aspect of this problem is that if labour were available it would be three years even before the Nova Scotia collieries could be brought to the point where the output would equal that of 1913. Bearing in mind that from the sea coast westward to places beyond Montreal there is no Canadian source of coal other than the Nova Scotia product there seems no prospect of remedy short of action by the National Government.—(*Can. Chem. J., Mar.,* 1918.)

SOUTH AFRICA.

The Department of Industries has been informed that a cotton seed oil-expressing plant, imported to the order of one of the principal manufacturing firms in the Union, is at present on the water.

The attention of the Department of Industries has been called to the increasing difficulty in obtaining supplies of ammonia for refrigerating purposes. While the consumption of this article is not at present large, there is every possibility that the demand will be much increased. In this connexion it is interesting to learn that a Johannesburg company has succeeded in producing Liq. Ammonia Fort., and that it will be in a position to supply the total wants of the Transvaal, whilst arrangements could be made to supply the other provinces also.

Slate pencils, tailors' chalk, blanco, toilet powders, etc., are now being manufactured in the Union from talc mined in the Barberton District (this J., 1918, 35 R). Very large quantities of powdered talc are used for the inside of tyres, for soap and paint manufacture, for dressing leather and lasting of boots and shoes. Practically the whole of the Union requirements in many of these lines are now being supplied from local sources, while only the scarcity of shipping freight prevents a fairly large export trade.

A report has been received from the Imperial Institute on a sample of *Rubia cordifolia* roots from the Weenen District of Natal, which was thought might be of commercial value as a source of madder dye. The Institute states that the sample was too small for complete investigation, but the preliminary experiments indicate that the roots possess tinctorial properties about equal to those of *R. cordifolia* from India, and much stronger than those of a commercial sample of ground madder root. The roots could be used for dyeing in South Africa and would probably give a fairly wide range of colours, similar to those produced with madder. Specimens of wool dyed with the Natal roots were submitted to a firm of manufacturers who stated that the material appeared to be very good; there was, however, only a limited demand for madder root at the present time.—(*S. Afr. J. Ind., Feb.,* 1918.)

GENERAL.

The Streatfeild Memorial—It has been suggested that a fitting tribute to the late F. W. Streatfeild's merits as a great teacher of practical chemistry would be the endowment of a Streatfeild Memorial Lecture and Prize for Practical Chemistry, the lecture to be delivered annually by a former Finsbury chemical student and the prize to be open for annual competition among Finsbury students completing the courses in applied chemistry.

These suggestions are put forward for the favourable consideration of the friends and colleagues of the late Mr. Streatfeild, who are invited to communicate their views on the subject to Mr. A. J. Hale, of the Technical College, Finsbury, Leonard Street, E.C.2.

New Source of Toluol.—At the meeting of the Technical Association of the Pulp and Paper Industry at New York on February 6—7, it was announced that toluol can be produced from spruce turpentine. During the cooking of the chips in sulphite digesters, the oil formed is usually allowed to escape with the steam, although processes of recovery are carried out in a few mills. A representative of the War Committee, present at the meeting, said that it was understood that 300,000 gallons of toluol could be recovered from the mills in the United States at very little expense.—(*Met. and Chem. Eng., Mar.* 15, 1918.)

Russia's Industrial Losses.—A *Reuter* message from Petrograd of April 11, states that the Commissariat of Commerce has issued a summary of what Russia has lost by the peace treaty of Brest-Litovsk. The losses specified are: 73 per cent. of the total iron production, 39 per cent. of the total coal production, 268 sugar refineries, 918 cloth factories, 574 breweries, 173 tobacco factories, 1685 spirit distilleries, 244 chemical factories, 615 paper factories, 1073 machine factories, 21,530 kilometres of railways (one-third of all the railways of Russia), 56 million or 32 per cent. of the whole population, and 780,000 sq. kilom. of territory.

Castor Beans in the Dominican Republic.—Great interest is being taken in the cultivation of the castor oil plant in the Dominican Republic, the Department of Agriculture having urged farmers to cultivate it in view of the high prices prevailing for the oil, the result of the great demand for it as an aeroplane lubricant. The castor oil plant has been cultivated in the past on a small scale for local consumption, and the quality of the beans is said to be excellent. As much as 300 bushels of castor beans have been known to be raised on one acre of land. There is every indication that

the castor bean will soon become an important article of export from the Dominican Republic.—(*U.S. Com. Rep., Feb.* 23, 1918.)

Sisal Cultivation in Antigua.—During the year 1916—17 a definite start was made in Antigua in connexion with the planting of sisal on a commercial scale. According to the Report of the Agricultural Department for that year, just to hand, the number of plants set out was some 8000. This number is not particularly large, but arrangements are being made to import from the Island of Anguilla large quantities of these plants, so that every hope is entertained of planting somewhat extensive areas under this crop. When this is accomplished, and the crop is sufficiently advanced, it is the intention of the firm which is undertaking the work to import modern machinery for decortication.—(*Rep. of Agric. Dept., Antigua,* 1916.)

Banana Fibre for Bag-making.—According to a report of the United States Bureau of Commerce, investigations are being made in the Hawaiian Islands into the possibility of utilising the fibre of the banana plant in the manufacture of bags for the local industry. Hitherto the Hawaiian planters used bags imported from India in which to export their raw sugar. These Indian-made bags, which held 125 lb., were quite satisfactory, but war conditions have made it necessary to find a substitute.

The investigators in the present experiment find that the banana fibre is of the proper quality, but they have also found that a large number of banana plantations contain the stubby plant sometimes known as the "Chinese banana." The Bluefield banana was introduced into Hawaii about ten years ago and is flourishing, but has not by any means displaced the sturdy Chinese type, which appears satisfactory to the growers, who are principally Chinese. The investigators have not completed their inquiries, but they are satisfied from the results so far obtained that the industry will be established in Honolulu.

"*Super-Explosives.*"—In a recent communication to "La Société suisse de Chimie," A. Stettbacher dealt with the subject of explosives which are chemically or theoretically possible. To obtain the maximum production of heat from a combustible substance, it must undergo direct combustion in an exact quantity of oxygen. In the case of explosives, this condition is realised with "oxyliquite," a mixture containing liquid oxygen which develops 2000 calories on combustion, as compared with 1580 calories from nitro-glycerin. The ozonides of ethylene and benzene develop less heat than "oxyliquite," but their disruptive power is far greater—probably the greatest known. The highly unstable trichlorate of glycerol contains relatively more oxygen and greater endothermic energy than any other explosive, and its heat of explosion should be about 3000 calories. Theoretically the most powerful of all would be a stoechiometrical mixture of liquid hydrogen and liquid ozone, 1 kilo. of which would liberate 4500 calories. Although there is no strict comparison, it is worthy of note that in the disintegration of radium the energy set free exceeds the latter figure by more than 200,000 times.—(*Rev. Gen. d. Sci., Feb.* 15, 1918.)

Molybdenum and Tungsten in South China.—Small quantities of molybdenite have of late been exported from Hongkong to Great Britain and France and considerable quantities to Canada for concentration and subsequent re-export to these countries. The U.S.A. is also entering the market for this ore. The extent of the molybdenite deposits is yet uncertain. So far, the samples have been collected over a wide area, apparently from pockets on the surface unrelated to known quartz beds, and there seems little doubt that the ore can be obtained in considerable quantities. It is a hard ore, thus removing one of the difficulties that occur with the working of specimens from other sources, but the freedom from tungsten, arsenic, bismuth and copper is yet to be ascertained.

The development of the wolframite deposits at Hongkong (this J., 1918, 13 R) is proceeding successfully. These deposits are not mere pockets but consist of the actual ore strata or ledges extending far into the earth. Six outcrops have been discovered and three are more or less under development. The ore runs as high as 18 per cent. tungsten, and the veins are 10—18 inches thick, though the area over which the ledges extend is yet to be discovered. Even more extensive deposits of the ore are reported in Hunan province, about four days' journey from Hongkong, and these are under investigation.—(*U.S. Com. Rpts., Jan.* 30, *Feb.* 19, 1918.)

Magnesite in the U.S.A.—The production of magnesite in the United States in 1916 was a record one, being more than five times as much as that raised in 1915, and about fifteen times as much as the average of the three preceding years. This was due to the reduction in imports from Europe. Curiously enough, the amount of native magnesite used in the States was less in 1916 than in any of the years, 1912-1914. The chief sources of supply are in Tulare, Santa Clara, Sonoma, Napa, Kern and Fresno counties (all in California), and since 1916, Stevens County, Washington. Unfortunately in normal times the cost of mining and transporting the mineral from the Western to the Eastern States, where it is used as a refractory material, is greater than that of shipping from Europe, so that the outlook for the native material is not promising.

Californian magnesite does not possess the natural binding properties of the Austro-Hungarian material, but bears a closer resemblance to the Grecian material. Although most of it is used as a refractory material in the manufacture of steel and copper, a considerable quantity is employed in the production of flooring plaster and in the preparation of digestion liquors for the manufacture of paper, but the recent increase in cost renders the substitution of dolomite and other cheaper materials necessary wherever possible.

The quality of the Californian material varies considerably, and owing to the manner in which it occurs in association with serpentine, it is uncertain how long the supplies will last. The situation has been eased by the opening in Stevens County, Wash., in 1916 of extensive deposits of a more massive character, this material being coarsely crystalline, resembling marble, and of sedimentary origin. The use of this magnesite in large quantities since early in 1917 has shown that it is satisfactory as a refractory material. Much of the magnesite is placed on the railway in the raw state, but a number of the larger producers have calcining furnaces of the rotary and vertical shaft types. No information is available as to the temperature of calcination.—(*U.S. Geol. Surv., Jan.* 16, 1918.)

Brazilian Manganese Deposits.—A property in Northern Brazil of some 20,000 acres has recently been prospected and found to contain very extensive manganese deposits. So far the exploration has been confined to one hill—the "Deus te Ajuda"—where it is calculated that 300,000 tons of ore can be obtained by simple adit mining. The distance from the deposit to the Piracaua River, which offers access to large vessels, is only 4½ miles and it is estimated that the ore could be delivered f.o.b. Piracaua Harbour at a cost of

2 dollars per ton. Comparing this with the present large Brazilian mines, the cost of ore delivered f.o.b. Rio de Janeiro Harbour from the Lafayette district was 5 dollars per ton before the war. The property contains abundant supplies of timber suitable for building and fuel purposes. Labour is cheap and the climate healthy. From all points of view these new deposits are better located than any of the known manganese mines.

A large number of samples of the ore have been taken and assayed. The manganese content varies from 31 to 51 per cent.: an average sample from three of the best lodes gave the following figures:—Manganese, 48·10; iron, 7·25; silica, 5·15; phosphorus, 0·082. The ores are partly black and friable, partly hard compact and crystalline, and all contain a fair proportion of iron. The quality of the ores could be greatly improved by calcination, using native timber as fuel.—(*U.S. Com. Rep., Feb.* 8, 1918.)

Production of Oil from Walnuts.—According to a statement made by the Minister of the Interior, in the year 1917-1918 7700 cwt. of walnuts have so far come into the hands of the authorities, as against 5000 cwt. last year. This quantity of nuts will yield 1078 cwt. of oil. As the weekly fat ration is $\frac{1}{8}$ lb., this will provide one week's ration for 800,000 persons. If the oil is worked up with raw tallow into margarine, 3080 cwt. of margarine can be produced, which would provide a weekly ration for about $2\frac{1}{2}$ million persons.—(*Münchner Neueste Nachrichten.*) [*Bd. of Trade J., April* 11, 1918.]

The Indian Indigo Industry.—In the *Agricultural Journal of India* (1918, 13, 32—46), W. A. Davis, Indigo Research Chemist to the Government of India, presents a historical and statistical review of the natural and synthetic indigo industry. He shows that the value of the total world's market before the war considerably exceeded 5 millions sterling (certain smaller indigo-producing countries being excepted), and that this value was not far short of that of all other artificial organic dyes put together. The growth of the synthetic industry, the economic failure of the original Baeyer process owing to the insufficient supply of toluene, the success of the process starting from naphthalene and its effect upon the manufacture of sulphuric acid, are succinctly described, and tables are given showing the exports of synthetic and natural indigo from Germany and India. Statistics are also presented showing the effect of the war upon the price of natural indigo in Calcutta, and the areas of land under indigo cultivation and the yields obtained. The area of land under cultivation in India during 1916—17 was 114 per cent. greater than in 1915—16, and 244 per cent. greater than the average for the preceding 5 years. The estimated yield has increased to 95·500 cwt. of dye in 1916—17, compared with 55·100 cwt. 1915—16, and an average of 37·600 cwt. for the preceding 5 years. The great importance of the markets in the Far East is strongly emphasised. In 1913, China and Japan consumed 27,081 tons of indigo (20 per cent. paste), whereas Great Britain, her Dominions, and the United States, took only 6179 tons. In the same year, China and Japan together took three-fifths of the whole production of synthetic indigo. Such data lead to the conclusion that the future of the Indian industry is bound up with its ability to supply the Eastern markets. The author is inclined to dissent from the view expressed by Prof. G. T. Morgan that the recent resuscitation of the natural product is of the nature of a temporary spurt. "Provided certain improvements in actual practice can be effected—they are clearly possible—the natural indigo will be able to put up an interesting fight with the synthetic dye."

Water Power in Great Britain.—A paper of industrial interest was read recently before the Royal Society of Arts by Mr. A. Newlands on Water Power in Great Britain (with special reference to Scotland). In referring to the Report of the Coal Conservation Sub-Committee and its proposal to establish super-power stations, the author declared that the use of water power in this country had been almost entirely neglected. According to the Census of Production of 1907 only 1·6 per cent. of the total power of industrial engines was being obtained from water power, and in view of the fact that many thousand square miles of country have an annual rainfall of 50 ins. or over, there can be no doubt of the need for investigation. The district in Scotland lies chiefly to the west of the Highland Railway and is nowhere more than twenty miles from the sea or the Caledonian Canal. The coast line is indented with fine inlets suitable for shipping and there are many lochs at fairly high levels which could be made to serve as reservoirs.

The author has calculated the power to be obtained by impounding the discharge from loch basins having an average rainfall of 42 ins. or over, and after allowing one-third, or 14 ins., for loss by evaporation and for the supply of rivers, he finds that if the flow for 24 hours was utilised in turbines in 12 hours a total of approximately 375,000 h.p. would be available, and that by diversion and linking up of surrounding areas as much as 650,000 h.p. would be available for, say, 100 days' supply.

The chief installation existing at present is that of the British Aluminium Co., Ltd., at Kinlochleven and Foyers, where power is stated to be obtained at a cost of approximately 34 shillings per h.p. per annum, continuous working.

There is a further source of power to be obtained from the flow of rivers, but this has not been included in the calculation, owing to the difficulty of calculating the available average flow from the information at present in our hands.

To retain the water power for the nation the author advocates its development under control of the Government in a similar manner to that exercised by the Canadian Government. The water powers are leased out to users for a period of years and revert to the Government at the end, together with certain of the improvements and buildings so that there is no danger of their falling into the hands of private owners.

Mr. Archibald Page, of Glasgow, estimated the municipal and industrial power requirements of Scotland at the end of 1916 to be 1,119,000 h.p., so that there is sufficient water power in the Highlands to meet a large part of the requirements. It is, however, doubtful if the cost of the development and the transmission of power be allowed for, whether it would be obtained any more cheaply from water power than from coal converted into power at the pit head. It is noteworthy however that the region where this power is available is remote from the coalfields, and embraces some of the finest agricultural areas of the North. There has been a considerable tendency of late years to establish certain factories away from the great centres of industry. If the water power of the Highland district, which contains much undeveloped mineral wealth, were utilised and suitable industries established, a good deal would be done to help the extension of agriculture, as work would be provided for the people during the winter period when work on the land is impossible.

Some particulars as to the possibilities of water power in other districts of the United Kingdom were given, but the most hopeful locality for a start in the development of water power is the Highlands of Scotland.

PARLIAMENTARY NEWS.

Irish Peat.

The President of the Board of Education (Mr. H. Fisher) said in reply to Mr. Roland, that the Report of the Irish Peat Enquiry Committee had been received, and was under consideration by the Fuel Research Board. No arrangements had as yet been made as to its publication.—(April 9.)

Sugar Industry.

Captain Wright asked the Prime Minister whether the recommendations of the British Empire Producers' Organisation for the Development of the Sugar Industry of the Empire, laid before the Government on the June 21, 1916, have yet received the consideration then promised; has any action been taken; and if he will take an early opportunity to make a declaration of the Government's future policy in respect of this industry.

In reply, Mr. Bonar Law said that he could not make any statement at present beyond the assurance that the future of the sugar industry of the Empire has received, and will receive, the earnest consideration of the Government.—(April 9.)

Treatment of "Gassed" Soldiers.

The Under-Secretary of State for War, answering a question put by Sir C. Greenwood, said that the oxygen method of treatment is still under trial, and, although promising results had been obtained, it is not intended to promote a general adoption of the treatment until further information as to its efficiency has been acquired.—(April 11.)

Blast Furnace Flue Dust.

The Parliamentary Secretary to the Board of Agriculture (Sir R. Winfrey), replying to Mr. Wright, said: I am informed by the Ministry of Munitions that no instructions have been issued requiring any blast furnace owner to sell flue dust to any particular person. Licences have been granted on the advice of the Food Production Department to a limited number of wholesale collecting agents, authorising them to sell certain qualities of blast furnace flue dust from blast furnace owners, and to sell the dust to licensed agents to resell to farmers. These agents are required, as a condition of their licence, to sell at prescribed prices, but the price at which the flue dust is purchased by the wholesale collecting agents from the furnace owners is not fixed, and is a matter of arrangement between the buyer and seller. It is believed that several firms have old-standing contracts, which enable them to obtain supplies at low prices. I am sending the Hon. Member a leaflet which we have circulated on blast furnace flue dust as a potash fertiliser, in which the prices and other details are set out.

Mr. H. Samuel: Is my Hon. Friend aware that the arrangements made by the Government in this matter have been received with much dissatisfaction by the ironmasters in the North and on the West Coast, and that representations were made to the Ministry of Munitions some weeks ago, to which no reply has been received; should any further representations be made to his Department or to the Ministry of Munitions?

Sir R. Winfrey: After what the Right Hon. Gentleman has said, I will go into the matter closely.

Mr. Wright: In view of these facts, and having regard to the price of flue dust, will the Hon. Gentleman reconsider the prices charged to the farmer for artificial manure?

Sir R. Winfrey: I will take up the matter with the Ministry of Munitions without delay.—(April 18.)

LEGAL INTELLIGENCE.

SALICYLIC ACID PLANT. *Lennox Foundry Co.* v. *Warrington Drug and Chemical Co.*

Judgment was given on April 10 by Mr. Muir Mackenzie, Official Referee, in the action of the Lennox Foundry Co., of New Cross, London, against J. H. Whittaker and others, trading as the Warrington Drug and Chemical Co. The hearing occupied several days during the last sittings.

Plaintiffs sought to recover payment on account of plant supplied to defendants for the production of salicylic acid. The plant was delivered, but the defendants did not pay the 25 per cent. due on delivery, and it was this sum for which plaintiffs sued.

The defence was that the plaintiffs guaranteed that the plant should produce one ton of acid per week, but that it never did produce such an amount, and never could do so. The defendants counter-claimed for damages. Plaintiffs denied giving the warranty.

The Official Referee, in giving judgment, said the contract was for providing plant for producing salicylic acid for a sum of £880, and the plant was to produce one ton of acid per week. Half the purchase money was to be paid with the order, £220 was to be payable on delivery, and the remaining £220 was to be paid when plaintiffs had attended at the works and given instruction how the plant should be used so as to produce the amount of acid required. Plaintiffs accepted this order in May, 1916, and the sum of £440 as part of the purchase money. The plaintiffs stated that the plant was designed to give the output required, and would do so if properly worked. He could not agree with the view put forward by the plaintiffs that they did not give a warranty. He could not hold that the statement in plaintiffs' letter accepting the order purported to qualify plaintiffs' obligation.

The defendants could not be compelled to accept a plant giving a smaller output than that described in their order. Where a contractor or manufacturer undertook to supply a plant of agreed capacity of output for a lump price, the purchaser was entitled to rely on the performance of the contract, and if there was any modification, it was not to be taken that the purchaser had accepted an article which by variation of a component part affected the output specified unless his attention had been expressly drawn to the whole of the facts. Plainly the plaintiffs broke their agreement. The autoclave was not of the capacity to produce the amount of acid required. The inference he drew from the evidence was that the charges supplied to the autoclave had to be much smaller than those indicated by the plaintiffs, and the time taken in the process was much longer owing to the special nature of the plant, and for the purpose for which it was required he could not ascertain the money value of it as it was delivered, and in these circumstances he had to consider what sum it would be necessary to expend in order to enable the plant to produce the amount of acid specified.

The plant was delivered in September, 1916, and although not satisfying the requirements, it was not so deficient in value as defendants would make out. He found that by certain additions, and by satisfactory working, the plant was capable of producing good commercial results. By an additional autoclave, and an additional hot-air still, the amount of acid as agreed would be produced. This would cost £750, and he assessed this sum as the measure of damages that should be awarded to the defendants. He thought defendants ought to be released from payment of the balance of the purchase price. Judgment would be for

the defendants on the claim and counter-claim for £750, against which there would be a set off of £220. It was a case of considerable difficulty and importance, and therefore he would stay all proceedings for fourteen days to give the parties an opportunity of considering whether or not they would appeal to the Divisional Court. If they decided to appeal, the stay would be extended until the appeal was disposed of.

Contracts with Enemy Chemical Firms.—In the King's Bench Division on April 9, Mr. Justice Bray set aside contracts made by the Rio Tinto Co., Ltd., with the Chemische Fabrik Wagenmann of Vienna, and the Fabrik Chemische Produkte, Hrastnigg, for the supply of some hundreds of tons of washed sulphur ore. The contracts were made by plaintiffs' agents in Germany, and the proceedings were brought under the Legal Proceedings against Enemies Act, 1915. His Lordship made an order terminating the contracts as from August 12, 1914.

GOVERNMENT ORDERS AND NOTICES.

CONVERTER PLANT CONTROL ORDER, 1918.

The Minister of Munitions, in exercise of the powers conferred upon him by the Defence of the Realm Regulations, and all other powers thereunto enabling him, hereby orders as follows:—

1. No person shall on or after the date hereof until further notice purchase or manufacture, or erect or instal in or in connexion with any factory, workshop, steel works, shipyard, colliery or other premises for the purposes of which alternating current is or can be made available, any rotary converter plant, motor generator plant or converter plant of any description for transforming alternating current to direct current, or any part of such plant (all or any of which shall be included in the expression "converter plant") except under and in accordance with the terms of a licence issued on behalf of the Minister of Munitions by the Director of Electric Power Supply.

2. Nothing herein contained shall prevent the carrying out of any necessary repair to converter plant already installed at the date hereof, or the purchase, manufacture, erection or installation of converter plant required solely for electrochemical or electrolytic processes or electric traction.

3. All applications in connexion with this Order shall be made to the Director of Electric Power Supply, Ministry of Munitions, 8, Northumberland Avenue, W.C.2.

4. This Order may be cited as the Converter Plant Control Order, 1918.

Note.—The licence required by this Order is in addition to and not in lieu of the usual Priority Certificates and permit reference number.

Applicants for licences are warned against purchasing or installing direct current motors before the licence for the necessary converter plant has been obtained.

April 5, 1918.

MICA CONTROL ORDER, 1918.

The Minister of Munitions has ordered that, on and after April 15, 1918, all dealings in, and utilisation of, mica shall be restricted to persons holding a licence from the Ministry, Particulars regarding stocks, etc., and applications for licences (marked "Mica Licence") are to be sent to the Controller of Non-Ferrous Materials (MS/R), Ministry of Munitions, 8, Northumberland Avenue, W.C.2.

The expression "Mica" means block mica of the following quality and size grades:—
Clear and partly stained "Ruby" of "best" or "Government standard" quality, or suitable for use in the manufacture of magneto-condenser plates, in size grades No. 3 to No. 6, inclusive, or their equivalent in rectangular or other trimming, and shall include mica coming within the above definition when split from block of any quality.

GETTING OF COAL FROM UNWORKED SEAMS.

By an Order in Council, dated April 13, 1918, an amendment was made in the Defence of the Realm Consolidation Act of 1914, whereby a new regulation (9GGG) was inserted for the purpose of increasing the supply of coal. The Board of Trade may now authorise any person to take possession of any seam of coal which is in or near an open mine, and which is for the time being unworked; and for this purpose, possession may be taken of land and all necessary works executed. Prior to granting such authorisation, the Board of Trade must give public notice of its intention in a manner best calculated to convey that intention to the knowledge of the owners of the property in which the seam occurs. The Board is to keep plans of the site and extent of the seam, and accounts of the coal gotten. In determining the compensation to be paid, the royalties current in the same mining district for the same class of coal must be taken into consideration.

Other Orders, etc.—Woollen and Worsted (Consolidation) Order, 1917. Amendment. Army Council, March 23.

Sugar (Domestic Preserving) Order. Ministry of Food, March 28.

Bread (Use of Potatoes) Order. Ministry of Food, March 27.

Building Bricks Control Order. Ministry of Munitions, April 5.

Hemp (Restriction of Consumption) Order, 1918. Amendment. Army Council, April 13.

The Tow (Restriction of Consumption) Order, 1918. Army Council, April 13.

PROHIBITED EXPORTS.

By an Order in Council, dated April 12, 1918, the Proclamation of May 10, 1917, prohibiting the exportation from the United Kingdom of certain articles, was further amended as follows*:—

(1) *That the following headings should be deleted:*—

(C) Balsams; (C) Aloes; (C) Areca or betel nuts; (C) Arecoline; (B) Benzoic acid (synthetic) and benzoates; (B) Bromine and alkaline bromides; (C) Buchu leaves; (B) Caffeine and its salts; (C) Calabar beans; (C) Cantharides; (C) Cascara sagrada and its preparations; (B) Chloral and its compounds and preparations; (C) Coca leaves; (C) Colocynth; (B) Copper sulphate; (C) Cubebs; (B) Ergot of rye; (B) Formic aldehyde; (C) Halogen derivatives of aliphatic hydrocarbons (except

* The prohibition of exports is as follows —
Goods marked (A) to all destinations.
Goods marked (B), to all ports and destinations abroad other than ports and destinations in British Possessions and Protectorates.
Goods marked (C), to all destinations in foreign countries in Europe and on the Mediterranean and Black Seas, other than France and French Possessions, Russia, Italy and Italian Possessions, Spain and Portugal, and to all ports in any such foreign countries, and to all Russian Baltic ports.

carbon tetrachloride); (C) Hydrastis canadensis and hydrastine; (C) Iodine and its compounds and preparations; (C) Jalap; (C) Nux vomica and its preparations; (C) Nux vomica alkaloids and their salts and preparations; (C) Rhatany root; (C) Rhubarb (medicinal); (C) Santonin and its preparations; (C) Senega; (B) Senna leaves and pods; (C) Sodium sulphide; (C) Squills; (B) Tartaric acid, cream of tartar, and alkaline tartrates; (B) Gum arabic; (A) Gum damar; (A) Gum tragacanth; (C) Gums, not otherwise prohibited; (B) Lacs, not including lac dye; (C) Oil, blast furnace; (B) Oil, fish, not otherwise prohibited, and mixtures containing such oils; (A) Oil, seal, and mixtures containing such oil; (A) Oil, sea-elephant, and mixtures containing such oil; (A) Oil, shark, and mixtures containing such oil; (A) Oil, sperm, and mixtures containing such oil; (A) Oil, whale, and mixtures containing such oil; (A) Resins, resinous substances (except such as contain caoutchouc), and articles containing resins and resinous substances; (B) Shellac; (B) Tin, manufactures of (except hollow-ware, tin plates, and receptacles made from tin plates); (A) Tin plates and receptacles made from tin plates; (B) Wool grease.

(2) *That the following headings should be added:—*

(A) Balsams; (A) Aloes; (A) Areca or betel nuts; (A) Arecoline; (A) Benzoic acid (synthetic) and benzoates; (A) Bromine and alkaline bromides; (A) Buchu leaves; (A) Caffeine and its salts; (A) Calabar beans; (A) Cantharides; (A) Cascara sagrada and its preparations; (A) Cascarilla bark; (A) Chloral and its compounds and preparations; (A) Chloroform; (A) Coca leaves and their preparations; (A) Colocynth; (A) Copper sulphate; (A) Cubebs; (A) Damiana; (A) Ergot of rye; (A) Formic aldehyde; (A) Gelsemium root; (A) Grindelia; (C) Halogen derivatives of aliphatic hydrocarbons (except carbon tetrachloride, chloroform and iodoform); (A) Hydrastis canadensis and hydrastine; (C) Iodine and its compounds and preparations (except iodoform); (A) Iodoform; (A) Jalap; (A) Male fern rhizome; (B) Nux vomica and its preparations; (B) Nux vomica alkaloids and their preparations; (A) Podophyllum rhizome; (A) Rhatany root; (A) Rhubarb (medicinal); (A) Santonin and its preparations; (A) Sassafras root; (A) Scammony root; (A) Senega root; (A) Senna leaves and pods; (A) Serpentary rhizome; (A) Sodium sulphide; (A) Squills; (A) Strophanthus seeds; (A) Tartaric acid, cream of tartar, and alkaline tartrates; (A) Cobaltchrom and similar alloys; (A) Gold, liquid, including gold paint, gold enamel, gilding solution, and all other pigments containing gold; (A) Gums, not otherwise specifically prohibited; (A) Lacs, not including lac dye; (A) Oil, blast furnace; (A) Oils, fish, and articles, mixtures, and preparations containing such oils; (A) Resins, resinous gums and resinous substances (except such as contain caoutchouc), and articles containing them; (A) Silver bullion, specie and coin and articles wholly or mainly manufactured of silver; (A) Stellite and similar alloys; (B) Tin, manufactures of (except hollow-ware, tin plates, and receptacles made wholly or partly from tin plates); (A) Tin plates and receptacles made wholly or partly from tin plates; (A) Wool grease, and articles and mixtures containing wool grease.

Switzerland.—The *Board of Trade Journal* of April 11 gives a full list, corrected to March 19, of articles in respect of which licences for export to Switzerland are only granted if the goods are consigned to the Société Suisse de Surveillance Economique (S.S.S.).

CLEARING HOUSE FOR DISPOSAL OF SURPLUS DYES.

An arrangement has been made by a number of the principal consumers of dyestuffs in the United Kingdom, whereby Messrs. Fairclough, Dodd and Jones, 46, St. Mary Axe, London, E.C.3, have been appointed their sole selling agents for the disposal of any surplus stocks of dyes which may from time to time be accumulated, subject to the approval of the actual manufacturers of such dyes who will have the option of repurchasing any particular lots in which they may be specially interested. These surplus stocks will in future be sold by tender through Messrs. Fairclough, Dodd and Jones, the same procedure being followed as was recently adopted in the case of several Prize Cargoes of dyes. Permission to tender will as a rule be strictly limited to actual consumers who will be required to give formal guarantees against re-sale. Special arrangements may, however, be made to meet the case of small users and for dealing with the export trade.

The scheme has the approval of the Board of Trade and will be worked in consultation with that Department.

Any firms desirous of joining in the scheme, which it is desired to extend as widely as possible, should apply to Messrs. Fairclough, Dodd and Jones for full particulars.—(*Bd. of Trade J., April 18, 1918.*)

FUEL OIL FROM HOME SOURCES.

The Minister of Munitions, in agreement with the Secretary of State for the Colonies and the Petroleum Executive, has appointed the following Committee to enquire into certain matters relating to the production of fuel oil from home sources:—The Marquess of Crewe (Chairman), Col. A. Stirling, Maj. Godfrey Collins, Engineer Vice-Admiral G. G. Goodwin (Engineer-in-Chief of the Navy), Sir R. Redmayne (representing the Controller of Coal Mines), and Sir Lionel Phillips (representing the Ministry of Munitions). The Secretary to the Committee is Mr. G. C. Smallwood (Ministry of Munitions). Terms of reference:—To consider the Report which has been rendered by the Petroleum Research Department on the production of fuel oil from home sources, and to advise to what extent and within what time it should be possible under present conditions to carry out the proposals made in this Report; and to consider the steps which have been taken by the Ministry of Munitions in this connexion.

Committee on Fuel Oil.—A Committee has recently been appointed by the Institution of Petroleum Technologists to inquire into the possibility of employing cannel coal and allied substances available in Great Britain as a source of supply of motor spirit, fuel oil, and other products, and to formulate a scheme for the utilisation of these minerals in the manner indicated.

The Committee includes:—Sir Clarendon Hyde (chairman), Lord Glenconner, Capt. R. W. Barnett, Mr. Chas. Greenway, Capt. A. FitzHerbert Wright, Sir R. P. Ashton, Admiral Sir Edmond Slade, Mr. E. W. Abram, Prof. J. S. S. Brame, Mr. W. J. A. Butterfield, Mr. A. W. Eastlake and Mr. A. E. M. Taylor.

The following are appointed Technical Advisers: Geological—Mr. E. H. Cunningham-Craig; Mineral and Supplies—Mr. J. A. Greene (Hon. Sec.); Retorting—Dr. F. M. Perkin; Chemical—Dr. A. E. Dunstan and Mr. A. G. V. Berry; Hon. Treas.—Mr. W. Rogers.

COLONIAL REPORTS—ANNUAL.

Falkland Islands (1916).—This flourishing little colony with a population of little over 3000 has a trade return of no less than £2,644,736. This is partially due to the high prices ruling for the chief exports—wool and whale oil. During 1916, the 23 factories and 60 whale catchers handled 11,861 whales; yielding 540,215 barrels of oil, value £1,723,225, 105,415 bags of guano, value £48,915, and 124 tons of bone, value £2430. These values are those declared for export duty, and. "there is good reason to believe, are a good deal less than the real values." In addition, 2906 seals were killed, yielding 5337 barrels of oil, valued at £16,011. The greater part of this oil is exported to the United Kingdom.—(*Col. Rep. No.* 936, 1*d*.)

Cyprus (1916—17).—Financially, the island has benefited greatly by the war and is in a state of prosperity. The total value of the imports during 1916 was £967,780, as compared with £588,019 in the previous year. Exports amounted to £708,446, as compared with £650,490. Wine to the extent of 1,242,432 gallons was exported, mainly to Egypt. Vingear (162,739 gallons), spirit (43,638 gallons) and sumac leaves also figure among the exports.

The mining industry is showing strong signs of revival. Thus 25,812 cwt. of asbestos were produced, compared with 4925 cwt. in 1914, the bulk being exported to Italy, the remainder to Spain. A copper mine is being worked in spite of freightage difficulties, 2014 tons of first-class ore having been produced. Amongst the other mineral products exported were 4702 tons of terra umbra, 3147 tons of gypsum, and 15 tons of magnesite.

New plantations of carob, olive, wattle, and eucalyptus are noted by the Forest Department. (*Col. Rep., No.* 941, 2*d*.)

Grenada (1916—17).—Most of the land in this colony is under permanent cultivation for such products as cocoa, limes and spices, these constituting the main exports. In 1916 the exports were valued at £534,233, cocoa alone being responsible for £449,944. The imports, valued £343,437, consisted mainly of clothing and foodstuffs, an increased demand for such luxuries as beer, wine and motor cars being noted.

The cocoa crop has been extremely good, being estimated at 77,000 bags of 180 lb. each. This was despite an attack of thrips disease which caused serious loss. The production of nutmegs and its by-product mace was very satisacftory, amounting to 1,940,965 lb., valued at £49,092. The war is probably responsible for the large increase in the production of limes, 27,265 barrels of fruit being produced as compared with 2684 in 1914; 150,525 gallons of raw juice and 7500 gallons of concentrated juice were exported.

The cotton crop shows a decline from 3293 cwt. to 3116 cwt. A little sugar was produced, but not sufficient to meet local consumption; vigorous efforts are being made to increase the crop.

Rum is produced for local consumption, while a Government-subsidised works produces ice.—(*Col. Rep., No.* 942, 1*d*.)

Jamaica (1916—17).—In August 1916, a destructive hurricane swept over this island, following the similar occurrence in August 1915. The Colonial report for 1916 is strongly coloured by this double disaster. Though the imports for the year amounted to £3,107,004 (as against £2,327,458 in 1915) and the exports to £2,821,234 (as against £2,228,664), the increase in value is the result of enhanced prices. The items showing the biggest improvements included sugar cane products, £606,603; dyewoods in bulk, £281,807; and dye extracts, £207,461; coconuts, £61,980; hides and skins, £28,854. The production of pimento (£22,643) showed a decrease.

The sugar crop has been a record one, 28,000 tons of sugar and 18,000 puncheons of rum being exported. The sugar industry in general is experiencing an energetic revival. Logwood has been in great demand, owing to the shortage of synthetic dyes, the product realising £800,000. A sisal hemp plantation is being started.

The Collector-General reports that considerable expansion is possible in the production of hides and skins, annatto, lime juice, copra and essential oils, leather and tanning materials.

The Government Laboratory has conducted investigations with regard to the fat content of cacao from various parts of the island and the composition of citrus fruits in relation to the standard of maturation adopted for citrus fruits in the United States.—(*Col. Rep., No.* 943, 2*d*.)

Gold Coast (1916).—The feature of the period under review has been the unbroken peace and prosperity of the Colony, for which a tribute is paid to the mother country.

The value of commercial imports was £4,881,920, an increase of 56 per cent. The items include 148,259 gallons of ale and porter, value £30,307; 1,785,830 gallons of gin and geneva, rum and other spirits, value £354,786; 1,269,441 gallons of petroleum oil, value £44,314; and perfumery to the value of £102,916, an increase of 190 per cent., due to the supply by British manufacturers of substitutes for goods formerly supplied by Germany. The U.S.A. supplied a large share of the total increase in imports.

Commercial exports valued £5,576,134, a decrease of 4 per cent. on the abnormally prosperous year of 1915. The exports of cocoa (72,161 tons, value £3,847,720) showed a decrease in quantity of 6 per cent., owing to the drop in prices and shortage of tonnage. The cocoa produced is of relatively poor quality. The big demand for rubber stimulated the industry, resulting in an export of 1,567,991 lbs., value £53,698, an increase in quantity of 242 per cent., mainly in the lower class paste varieties. Palm kernels (5857 tons, value £85,899), and palm oil (450,360 gallons, value £38,299) also showed substantial increases. There was, however, a decrease in the gold exported, owing to retention of stocks in the Colony, and also a decrease in kola nuts (6,760,898 lb., value £130,566.)

Mining: 378,785 oz. of gold were produced by mining and 4866 oz. by dredging. The conglomerate mines yielded 10·01 dwt. per ton; the quartz mines 10·59 dwts. per ton; while the alluvium deposits gave 2·6 grains per cubic yard treated. Work has been started on a manganese deposit, 4258 tons of high grade ore having already been exported (this J., 1918, 57 R).

It may be pointed out that owing to the abundance of native labour, both skilled and unskilled, the Government does not encourage European immigration.—(*Col. Rep., No.* 948, 3*d*.)

Ashanti (1916).—The imports for the year under review amounted to £1,140,750, an increase of 24 per cent. They included 1709 tons of spirit; 7500 loads of dawa-dawa, and 6000 loads of shea butter. Exports, valued £1,337,011, included 14 772 tons of cocoa, value £513,502, a decrease in quantity of 27 per cent. This is due to the unwillingness of the native farmer to gather in crops owing to the fall in prices. A determined effort is being made to improve the quality of the cocoa by means of model stations and travelling inspectors. The kola exports amounted to 1630 tons, value £186,600. An increase of 107 per cent. is shown in the rubber exported (654 tons, value £36,732); it is, however, of poor quality.

Mining is limited to gold, 115,704·21 oz., value £491,511 9s. 9d., being produced; the mines employ 100 Europeans and 3562 natives.—(*Col. Rep., No.* 949, 3*d*.)

DEPRECIATION OF PLANT.

Memorandum by the Board of Inland Revenue on the subject of allowances for Wear and Tear and Obsolescence of Plant and Machinery. [Cd. 9022, 1d.]

(*Abbreviated.*)

Legal position.

(1) The existing law authorises a deduction, in assessing the profits of any trade, manufacture, etc., chargeable under Schedule D, of such an amount as the Income Tax Commissioners concerned "may think just and reasonable as representing the diminished value by reason of wear and tear during the year of any machinery or plant used for the purposes of the concern." This deduction is in addition to the allowance made in respect of the cost of *repairs* to the machinery or plant. (2) There is no statutory limit to the amount the Commissioners may allow in any year, but the aggregate amount of the deductions must not exceed the actual cost of the machinery and plant to the person by whom the concern is carried on.

Rates fixed by agreement in certain trades.

(3) Although no fixed scale of allowance is prescribed by law, definite rates of depreciation on different classes of machinery have been agreed upon in a number of important industries as the result of applications by representatives of the industries to the Board of Inland Revenue. These allowances, whilst subject to the concurrence of the respective bodies of Income Tax Commissioners, are accepted by the taxpayers and are generally adopted.

[The rates alluded to do not refer to plant in chemical works, and in most cases they were fixed under pre-war conditions.]

Temporary variations necessitated by war conditions.

(4) Cases have arisen, especially since the commencement of the war, in which machinery is suffering *exceptional wear and tear* owing, for example, to extra hours of running, the difficulty of obtaining material for effecting repairs, the rougher usage to which the machinery is subjected owing to the employment of unskilled labour, and the fewer opportunities available for having the machinery overhauled. In such cases applications for special rates of depreciation are entertained, but generally speaking the circumstances of individual cases are found to vary so widely as to render it impracticable to fix a uniform scale and each application is dealt with on its own merits.

Obsolescence.

(5) In addition to the allowance for wear and tear of plant and machinery there has been in operation since 1897 an allowance for *obsolescence*. The necessity for this allowance arises from the fact that machinery has frequently to be replaced, before it is worn out, owing to its having become obsolete and incapable of competing with more up-to-date machinery. Accordingly, where new and improved machinery is introduced in place of machinery not wholly worn out, the Board of Inland Revenue agrees to the allowance, as a deduction from the profits of the year, of so much of the cost of replacement as is equivalent to the written down value of the machinery replaced less any sum realised by the sale of it—the balance of the cost of the new machinery being treated as an addition to the capital of the business.

Renewals.

(6) As an *alternative* to the allowances for wear and tear and obsolescence of plant and machinery, the cost of *renewing* the plant and machinery may be claimed as a deduction in the computation of Income Tax liability under Schedule D. When this course is preferred by the taxpayer, the amount to be allowed is the actual cost of the new plant and machinery (excluding any part of such cost which is attributable to additions or improvements, *i.e.*, to increase in capital) after deducting the scrap value or realised price of the plant and machinery replaced.

Buildings and other wasting assets excluded from the depreciation allowance.

(7) Buildings and wasting assets such as mines, annuities and leasehold interests do not come within the scope of the allowance for depreciation. The full cost, however, of maintaining trade premises in proper working order is allowed in computing profits for assessment.

"Controlled establishments."

(8) In one class of case, namely, concerns which are "controlled," under the Munitions of War Act, 1915, the Income Tax allowance has been temporarily extended, by the Finance Acts of 1916 and 1917, to include the deductions for "exceptional depreciation or obsolescence of buildings, plant or machinery" which are allowed for Excess Profits Duty and Munitions Levy purposes.

This allowance prevents the hardship that would otherwise arise owing to the circumstance that "controlled establishments," being held at the disposal of the Government, may be required to alter completely the course of their business and to undertake exceptional expenditure which may be of little or no post-war utility to them. The Finance Acts of 1916 and 1917 accordingly authorise the Commissioners to revise the Income Tax allowance so as to enable a deduction to be made from profits of the difference between cost and post-war value of installations and extensions (including buildings) which would not have been undertaken but for the war and the express requirements of the Government.

[An Appendix to the Memorandum contains sections of various Acts (from 1878 to 1917) relating to deductions for wear and tear.]

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, April 4, 11, 1918.)

The Johannesburg Municipal Council calls for tenders for 1600 tons of coal tar (Contract No. 365), by June 3, 1918. A copy of the specification may be seen at the Department of Overseas Trade (Basinghall Street, E.C.). [This intimation will be of use only to firms who can instruct agents in the Union by cable.]

The owner of a talc mine in British Columbia is desirous of hearing from U.K. buyers of talc, either in solid-cut to measurement or in powder form. Communications to the Canadian Government Trade Commissioner, Portland House, Basinghall Street, E.C.2.

Numerous commission agents, merchants, etc., in Italy desire to represent manufacturers or exporters of chemical products. Firms desirous of appointing agents in preparation for post-bellum trade should address inquiries to the Secretary, British Chamber of Commerce for Italy, 7, Via Carlo Felice, Genoa, and quote the reference number given in the *Board of Trade Journal*.

TARIFF CUSTOMS EXCISE.

British India.—The complete Schedule of Tariff Valuations as amended on Dec. 15, 1917, and which came into effect on Jan. 1, 1918, is given in the *Bd. of Trade J.* for April 4; and the alterations in the regulations in regard to the importation of goods from neutral countries re-exported from the U.K., in the issue of April 11.

Canada.—Petroleum may be sold or offered for sale for use in Canada for illuminating purposes when weighing not more than eight pounds and seventeen one-hundredths of a pound per gallon, subject to the flash test specified in Section 10 of the Petroleum and Naphtha Inspection Act.

Federated Malay States.—The import and export duties imposed under "The War Taxation Enactment, 1916" (No. 27 of 1916) will remain operative until Jan. 1, 1919. The additional export duties on tin and tin ore imposed under this Enactment are now further extended.

Peru.—Quinine, in any form, imported into Peru for use in combating malaria is now admitted free of import duty, port dues, and any other Customs charges.

Portugal.—A Decree (No. 3931) of March 14, provides that:—(1) For the duration of the European war, and for six months thereafter, the Portuguese Government reserves the right of being the sole purchasers and exporters of all minerals which may be of use in war industries or may serve to carry into effect the economic interchange of products to meet the national requirements. (2) The Government will through the Ministry of Labour, and at the instance of the Department of Mines, fix the prices for the sale of minerals to which the Government may think fit to apply this regulation. (3) Wolfram and chromium ores existing in the country shall forthwith become subject to the provisions of this Decree, and consequently all exportation of these minerals is prohibited, and any stocks in the country, either at the mines or elsewhere, shall, within five days from the date of publication of this Decree, be declared at the Department of Mines, under penalty of seizure of the minerals and their disposal by the Government without right to any compensation whatever.

Sao Thomé and Principe.—Cocoa exported in foreign vessels to foreign countries is exempted from the payment of the extra 50 per cent. export duty established by the Decree of May 17, 1894.

Spain.—Certain alterations have been made (Feb. 15) in the regulations concerning the taxation of sugar.

United States.—The War Trade Board has issued a list of commodities, licences for the import of which will be granted only under the following conditions:—(1) If the goods are actually shipped to the United States prior to April 15, 1918; or (2) if the goods are imported by rail from Mexico or Canada and are the produce of one or other of those countries or of some other country from which such goods are being licensed for import; or (3) if the goods are shipped to the United States as return cargo from ports in Europe, and then only when (*a*) they are shipped from a convenient port, and (*b*) they are loaded without delay, and (*c*) import from Europe is not specifically prohibited. (Articles, the import of which from Europe is specifically prohibited include: gelatine and manufactures thereof; all expressed vegetable oils; malt liquors.)

The list of commodities, the issue of import licences for which is conditioned as explained above, includes *inter alia: From all countries*:—Asbestos, broom corn, candlepitch palm and other vegetable stearin, all acids and muriate of ammonia, all coal tar distillates except synthetic indigo, fusel oil or amylic alcohol, citrate of lime, all salts of soda except nitrate of soda and cyanide of soda, sumac (ground or unground), explosives except fulminates and gunpowder, manure salts, fluorspar, gelatine, mantles for gas burners, meerschaum, nickel, oil cake, and all expressed vegetable oils. *From Europe only*:—Lemon oil, non-mineral paints and varnishes, graphite, pyrites, artificial silk, soap, tar and pitch of wood, zinc, etc.

TRADE NOTES.

BRITISH.

Trade after the War.—The President of the Board of Trade, Sir A. Stanley, in his address to the Associated Chambers of Commerce, on April 10, said the Board had been reorganised with a view to dealing with trade after the war. Under the new scheme the Board of Trade has been divided into two departments, the one dealing with industry and commerce, and the other with public service administration. It was considered better to have a few departments divided into sub-sections, than to increase the present number of Ministers and Ministries, and hence the proposal to establish a Ministry of Commerce was rejected. Ever since he had been connected with the Board of Trade, it had been his unwelcome task to control and restrict trade, but it had been done in the national interest, and some of the restrictions imposed would have to be continued for a period after the war. Nevertheless, when that time arrived, it would be the function of the Government to begin to remove the restrictions; no one desired them to be continued a day longer than the national interest demanded, and only in the case of railways and canals was a reversion to the pre-war state impossible. The Ministers of Reconstruction and of Labour, and he himself, cordially invited the co-operation of representatives of employers and employed. In referring to the problems which would need to be solved at the termination of hostilities, Sir A. Stanley said that in some cases our export trade had been practically wiped out, and in others it had diminished by one-half; but there was consolation in the fact that on the whole, the productive capacity of the country was not appreciably less than before the war. Maximum efficiency, economy of production, and, above all, maximum output were the three essential conditions of future prosperity.

British Industries Fair.—Before the British Industries Fair closed steps were taken to ascertain the total amount of business transacted during the Fair, and, although not quite all the figures have yet been received, the Board of Trade is able to state that orders amounting to close on £1,500,000 were booked by exhibitors at the Fair.—(*Bd. of Trade, J., Apr.* 11, 1918.)

* * *

Burmese Exports of Wolfram.—There has been recently a steady improvement in the output of wolfram from Burma. It is understood that the total shipments were about 4800 tons in 1917, compared with 3600 tons in the previous year.

Proposed Soap Factories in India.—It is understood that the Nizam's Government contemplates shortly opening a soap factory at Hyderabad, and it is quite probable that the Munitions Board will before long be running large factories at various centres in India for the manufacture of soaps and candles. The outlook for the oil trade is therefore promising. The West Coast is eminently suitable for the manufacture of glycerin, as oils of all descriptions are very plentiful.

Indian Hides and Skins.—The exports of kips for the current official year are likely to reach 375,000 cwt., valued at Rs. 5 crores, as compared with 187,702 cwt., valued at rather less than Rs. 2 crores, in 1914. According to the Controller of Hides and Wool, at least three-fifths of

the upper leather used in the United Kingdom in the manufacture of boots for the Allied Armies is supplied from East India kips. The minimum requirements of Army upper leather for the year 1917 were estimated at eighty million feet. Apart from exports, Indian tanneries have provided large enhanced quantities of leather accoutrements and boots for the Army in India as well as for the Indian expeditionary forces. (See this J., 1918, 72 R.)—(*Pioneer Mail, Jan.* 25, 1918.)

Trade Conditions in New Brunswick.—The Imperial Trade Correspondent, writing on Feb. 16, reports that Japanese goods are being imported in place of those formerly manufactured in Germany and Austria.

The development of coal in this district is of comparatively recent date, the coal (bituminous) lies near the surface in strata from 8—30 in. thick, and is easily removed with a steam shovel. The output last year was approximately 125,000 tons. War conditions have greatly interfered with the production of gypsum, only 41,360 tons having been quarried last year as against 72,000 tons in 1916. The deposits of this material are immense: 50 per cent. of it is manufactured into calcined plaster and finds a ready market in Canada. The oil and natural gas deposits in Westmorland County have undergone considerable developments. The production in 1916 was 610,118,000 ft. of natural gas, and 1345 barrels of petroleum. The deposits of copper ore in this district are very great, but mining operations have not been developed to any extent. One mine in operation is producing 50 tons per day, and new machinery is being installed to increase this to 100 tons. A copper mine in Charlotte County has recently been acquired by United States financial interests. The immense deposits of hæmatite found in New Brunswick are stated to be of such low-grade that it is not profitable to develop them. A soft red shale, about 30 ft. thick, admirably adapted for making face bricks of a bright red colour, etc., is found at Albert Mines on the Salisbury and Albert railway. There are several other deposits in the same locality.—(*Bd. of Trade J., Mar.* 28, 1918.)

FOREIGN.

Margarine Production in Holland. The Rotterdam Chamber of Commerce estimates the annual consumption of margarine in Holland at 30,000 metric tons, or 4·6 kilo. per head of population. The total amount produced in Holland during the past year was 180,000 tons, of which about 150,000 tons were exported, chiefly to England. —(*Chem.-Zeit., Jan.* 30, 1918.)

Chemical Manufactures in Uruguay.—In 1913 steps were taken by the National Institute of Industrial Chemistry at Montevideo to form a chemical factory. The project was postponed at the outbreak of war, but resumed early in 1915 to meet the scarcity of chemicals. A large range of products have been made and sold locally, including ammonia, alcohol, benzol, toluol, xylol, ether, naphthalene, carbonate of soda, Glauber salts, and nitrates of soda and potash. The production of organic chemicals has been restricted owing to lack of materials. The business in ether and sulphide of lime—the latter for sheep dips—has been very good. It is not intended to run the Institute in competition with local manufacturers, but when conditions again become normal to develop it into a research and consulting laboratory, with courses of instruction for students in industrial and applied chemistry.—(*U.S. Com. Rep., Jan.* 28, 1918.)

Macao Opium Monopoly.—The immense values connected with the opium traffic are well illustrated by the contract for the opium monopoly in the small Portuguese colony of Macao (China). The monopoly is for five years, and gives the right to import 260 chests of opium for local consumption and 240 chests for export. At its former sale, the monopoly realised the sum of $1,056,000 (local currency) per year, but in December, 1917, it sold for $6,676,000. It is estimated that the profit to the former buyer of the monopoly amounted to 3000 per cent.—(*U.S. Com. Rep., Jan.* 29, 1918.)

Chemical Works in Russia.—In spite of the unsatisfactory conditions prevailing in Russia, considerable progress has been made in the chemical industry during the war, due to the restricted imports of chemical and pharmaceutical products from abroad. According to a statement recently published by the Russian Ministry for Commerce and Industry, the number of chemical works in Russia on January 1, 1916, was 415, employing 70,227 workers, and this number has since increased to 470 factories with 92,679 workers. The total capital of the 69 companies established during the four years 1913—16 amounted to 62,200,000 roubles. Of the more important new companies formed during 1917, the following may be mentioned:—A.-G. für Fabrikation von Anilinfarben (capital 8,000,000 Rbl.); A.-G. für die Fett- und Seifenindustrie Tanais (4,000,000 Rbl.); A.-G. der Kinowiewski-Ultramarinfabrik, Dr. G. J. Wege (3,000,000 Rbl.); A.-G. der Moskauer Schwefelfarbenfabrik Sernokraska (500,000 Rbl.); Chemische-Pharmazeutische A.-G. Therapie (400,000 Rbl.); A.-G. Neo-Pharmakon (300,000 Rbl.); A.-G. der Finnischen pharmazeutischen Laboratoriums und Fabrik (1,000,000 Rbl.)—(1 rouble = 2s. 1d. nominal, 6d. (?) actual.—(*Schweizer Exporteur, Jan.* 5, 1918.)

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Denmark.—According to statements in the Danish newspapers, to which H.M. Minister at Copenhagen calls attention, a new company has been formed, with a paid-up share capital of half a million kroner, for the manufacture of "molersten" (heath clay stone), a material which can be used for insulation purposes.

Manchuria.—H.M. Consul at Dairen reports that a company, which was formed in 1916 for the exploitation of a new process for hardening bean oil with hydrogen, has paid a dividend of 8 per cent. on the first term's working. During this term the company used 273 tons of bean oil, and produced 232 tons of stearin, about 10½ tons of pure glycerin, 3¾ tons of crude glycerin, and about 27¼ tons of olein.

Japan.—Provision is made in the Japanese Budget for a number of industrial developments, as follows:—Investigation regarding medicinal herbs, 170,000 yen (one yen = 2s. 0½d.); the establishment of an industrial laboratory in Osaka 780,000 yen; hydro-electric investigation, 195,000 yen; extension of plant in the Government iron works, 11,581,000 yen.

The diamond trade has greatly developed in Japan of recent years. A company has recently been formed for the purpose of cutting diamonds.

The projected manufacture of imitation celluloid has been postponed owing to the non-arrival of the necessary machinery, and it is understood that the product is unlikely to be available in commercial quantities for some time.

Honduras Republic.—France and the United States supplied the drug market of this country before the war. The United States is now momentarily in possession; but the trade should return to former sources of supply if only on account of the superior European packing, which Americans have so far failed to imitate to the satisfaction of the local importers. Attention is also drawn to the market for chemical glass and bottles, boot polish, which are at present supplied by the United States, and ink.—(*Bd. of Trade J., April* 4, 1918.)

COMPANY NEWS.

SOUTHALL BROS. & BARCLAY, LTD.

Sir Thomas Barclay presided at the annual meeting held at Birmingham on March 25, and, in moving the adoption of the report, said that the nature of the company's business had greatly changed since the outbreak of war. Owing to the restrictions on the use of rectified spirit for all purposes except medicinal preparations, it was difficult to obtain spirit to dissolve the essential oils and to dilute the natural floral essences, and they had been obliged to direct attention to the question of obtaining alcohol from other sources. As a result, they had been able to cope with the demand. To the chemical manufacturers the application of chemistry to modern warfare had not been an unmixed blessing. The production of chloroform had been hampered by the lack of supplies of acetone and bleaching powder, and that of glycero-phosphates by the shortage of glycerin.

Sir Thomas alluded to the good work that was being done by the Association of British Chemical Manufacturers; and then stated that his company had been busily engaged in the production of synthetic and other chemicals, and that it had been necessary to increase the plant. They had made considerable improvements in the quality and output of sodium salicylate; the crystals were equal to, if not better than, the German product. They had also undertaken the manufacture of hippuric acid and its salts, also phenoquin, which replaced the German "atophan," and neo-phenoquin, both coal-tar derivatives used in the elimination of uric acid from the system.

A dividend of 10 per cent. and 1s. bonus per share, less income tax, was agreed to, and £20,000 was applied to writing down goodwill.

JOHN WRIGHT & EAGLE RANGE, LTD.

At the annual meeting of John Wright and Eagle Range, Ltd., held on March 27 at Birmingham, Mr. H. James Yates, chairman of the directors, referred to the special work which had been done for the leading pottery experts entrusted by the Government with the conduct of researches (particularly on the manufacture of hard paste porcelain) to discover such methods in pottery work as would remove the cause of monopoly which German porcelain manufacturers had long enjoyed in this country previous to the war. The "Porceflam" furnace had been in use for some time for research work, and experts had found it an unqualified success. Another recent patent apparatus was the "Auto-gas" Producer, which was specially designed to make producer gas for gas works; the producer was simple in construction and could be handled by unskilled labour.

MAYPOLE DAIRY CO., LTD.

Sir W. G. Watson, chairman of the company, presided over the 20th annual general meeting held in London on April 4. In moving the adoption of the report and balance sheet, he said that the net profits of the past year amounted to £747,249, after providing £250,000 for special depreciation on account of the damage to the goodwill of the retail stores, caused by the partial or complete transference of the retail margarine trade to the sugar retailers. This transference had very greatly damaged the retail business, and had rendered its prospects hopeless so long as present conditions continued. Eighty-five per cent. of the retail trade was in margarine. The turnover had exceeded £22,000,000, and the average sales of margarine had increased to over 2100 tons per week. During the period of 1915—17, the increase of profits had been 13 per cent. over the three preceding years, and this increase was very much smaller than for any previous period in the recent history of the company.

The retail distributing business had yielded a weekly net profit of over £6400 during the past six years, but owing to the cause above-mentioned, all net profit will now entirely cease and be replaced by a net loss of over £1000 per week. To enable them to meet the new financial position, all their large Danish trade investments had been disposed of, for £1,039,600 cash. The policy of increasing the home production of margarine had necessitated the expenditure of £1,220,000 on new plant. The Board had handed over £10,000 to the trustees of the co-partnership shares as a guarantee fund to cover, as far as practicable, the loss on the original average cost of those shares held by their employees. In answer to a shareholder, Sir W. G. Watson said that a profit was being made by their margarine factories, which were working night and day.

OBITUARY.

A. G. SALAMON.

Alfred Gordon Salamon was born in 1858, the son of a London merchant, his father being partner in the firm of Wilson, Salamon and Co. After the completion of his school education he had a short experience in the draughtsmen's office of Messrs. Yarrow, at Poplar, and then entered the Royal School of Mines in 1877, where he worked under Frankland, Huxley and Judd, and took the Associateship in 1882.

On leaving College he worked for a short time in a laboratory at his father's house and subsequently established his laboratory in the City of London, where he initiated and continued his life's work as a consulting chemist.

In the earlier days of his practice, Salamon devoted his attention chiefly to subjects connected with the fermentation industries, but subsequently became associated with many other fields of chemical industry, including gas purification, the extraction of cyanogen compounds from coal gas, problems connected with the use of china clay, the purification of water and several branches of industrial organic chemistry. Most of these subjects formed the bases for important communications to scientific and technical societies, including the Society of Chemical Industry. In 1888 he delivered the Cantor lectures on "Fermentation" to the Royal Society of Arts.

Salamon was a sound chemist, a well-read man with widespread interests, an exceptionally able linguist, eloquent, a man of business, possessing in a remarkable degree the faculty of getting quickly at the main facts of a matter—a faculty which served him in good stead in many important legal cases on technical subjects with which he was concerned. He was generous to a fault, and supported liberally alike charitable schemes connected with the Jewish poor in the East End of London as well as funds for scientific and other purposes.

He took a great interest in the promotion of both pure and applied science and was closely associated with many scientific societies. He was conspicuously successful as chairman of the London Section of this Society, a position he occupied in 1904; he acted also as a vice-president and as a member of the Council on several occasions.

In all these capacities his marked ability and keen insight into industrial problems were of the greatest value, and his co-operation will be greatly missed by all those who had been associated with him in his work.

REVIEWS.

A TEXTBOOK OF INORGANIC CHEMISTRY. *Edited by J. Newton Friend. Vol. IV. Aluminium and its Congeners, including the Rare Earth Metals. By H. F. V. Little. Pp.* xx + 485. *(Charles Griffin and Co.:* 1917.) *Price:* 15*s. net.*

A TEXTBOOK OF INORGANIC CHEMISTRY. *By A. F. Holleman, in co-operation with H. C. Cooper. New Edition. Pp.* viii + 521. *(New York: John Wiley and Sons, Inc.; London: Chapman and Hall.) Price* 10*s.* 6*d. net.*

The first of the volumes under review represents the third instalment of Dr. Newton Friend's textbook of inorganic chemistry. Volume I., containing a general introduction and the chemistry of the rare gases, and Volume VIII., dealing with the halogens and their allies, have been out for some time; the new issue, being Volume IV., covers the elements of Group III. in the Periodic Table.

If the reception accorded to Volume I. can be taken as a reliable criterion, the attempt to produce in the English language a comprehensive textbook of inorganic chemistry, on thoroughly modern lines, is likely to prove both welcome and successful. In its character and scope the work is intermediate between the ordinary general textbook of inorganic chemistry, and the dictionary or "Handbuch" type of work. In reality, it lies considerably nearer the latter, for although a large part of the contents is eminently readable, meeting, for instance, the requirements of the advanced student, yet the wealth of references, of which there is evidence on every page, will render the textbook of the utmost value to those who desire exhaustive information on some particular point by consulting the relevant original literature.

So far as space is concerned, the chief part of Volume IV. is assigned to aluminium on the one hand, and to the rare earth metals on the other; indeed the chapters dealing with the latter constitute more than half the volume, and form the most complete account of the chemistry of these elements which has yet appeared in the English language. Prominence is given to the discussion of the cathodic phosphorescence spectra of the rare earth metals, and Urbain's researches in this field are described in detail.

The standpoint from which Mr. Little writes is essentially that of pure chemistry, but although this aspect of the subject is in the foreground, room is found for much valuable information on the technical side. Reference may be made in this connexion to the chapters on "Clay and Ceramics" and on "Ultramarine." In addition there are sections scattered throughout the book which are of much interest in their bearing on applied chemistry; thus such topics as the working up of monazite sand for the rare earths, the preparation and properties of permutits, the production of artificial rubies, the application of the rare earths in pyrophoric alloys, and the conditions governing the electrolytic production of aluminium are discussed at the appropriate places, and the value of these sections is much enhanced by numerous references to patents as well as to original memoirs.

In looking through the volume one cannot fail to observe the notable extent to which physico-chemical data are recorded, and physico-chemical methods of presentation are employed by the author. This feature indeed is generally characteristic of modern textbooks of inorganic chemistry, and is the natural result of the stimulus which the development of physical chemistry has given to the study of the inorganic branch of the science. Facts long known have been put in a new and rational setting, problems regarded as already solved have been re-investigated by new methods and with valuable results, and the influence of external conditions on chemical change has been interpreted and formulated. In the volume under review, this influence of physical chemistry is evidenced, not only by equilibrium diagrams and solubility curves but also by the manner in which the amphoteric character of aluminium hydroxide, the strength of boric acid, the absorption spectra of the rare earths and similar topics are handled.

The other book under review represents a thorough revision of earlier editions by the Dutch author and his American collaborator. The work is an ordinary general textbook of inorganic chemistry, and, so far as the purely descriptive portions are concerned, it has many excellent, although no specially outstanding, features.

In this volume also physico-chemical conceptions and results are given much prominence, but there is distinct lack of judgment in their presentation. The book, intended evidently for the student at the beginning of his curriculum, is overloaded with physical chemistry of a type which properly belongs to a later stage. The discussions are frequently so condensed that they cannot convey any clear ideas to the beginner, and the introduction of mathematical formulæ in these sections is also of very doubtful value.

Another matter that invites criticism is the deliberate use of "aluminum" for "aluminium." It is quite true that Davy introduced the former term as the name of the metal presumed to be present in alumina, but it is not on such historical grounds that the change is made. "Aluminum" is said to be so widely used in the trade and in everyday life as to warrant the abandonment of the usual spelling. In other cases also, such as "allotropism" and "galenite," the American collaborator seems only too disposed to break away from established usage in chemical terminology. Such a practice, unless adopted on sound and generally accepted grounds, leads only to confusion.

JAMES C. PHILIP.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

SOME PROBLEMS OF THE MARGARINE INDUSTRY.

The need for economy in the consumption of the nation's resources has never, in the history of this country, been so clearly recognised as at present. Particularly is this true with regard to fuel, and the official support now given to fuel research induces the belief that incomplete utilisation of the total energy in a fuel will soon be regarded as little less than a national crime. But whilst the question of fuel economy is urgently claiming attention it will be well not to neglect the equally pressing claims of food economy. There is no doubt that the present unscientific methods of selecting and preparing foodstuffs for consumption involves serious waste of valuable energy, and it is important that every consideration should be given both to the question of educating the public in the science of nutrition and also to the problems which require extended research in this domain. It is not, however, the writer's intention to consider here the general problems of nutrition, but rather to confine his attention, in the limited space available, to a survey of the problems connected with the use of fatty foodstuffs, particularly margarine. Till within recent times butter was largely relied upon in this country for the requisite proportion of fat in the human diet, but the supply of butter is now quite inadequate for the needs of the nation. Moreover, it appears certain that the consumption of butter will proportionately decline in the future, so that the margarine industry and its problems will acquire increased importance. It may therefore be of interest to survey, in general outlines, some of the problems of this industry and to indicate the direction in which future research may be expected to turn. Hitherto industrial researches in this domain have aimed almost exclusively at the production of a margarine simulating butter in every respect, on the assumption that butter is the ideal fatty food, and that no change of object is probable, or indeed desirable, until it is proved definitely that other fats, natural or synthetic, are equal to butter in the ease with which they are assimilated and utilised for the support of the human organism. It may therefore be assumed with some degree of certainty that research in the margarine industry will continue to have for its object the production of a food identical with butter, and that it will involve the investigation of the following problems:

1. The production of a synthetic fat similar in composition to butter fat, or of a mixture of natural fats physiologically identical with butter fat.
2. The production of an artificial or synthetic milk.
3. The production of a suitable butter flavour.
4. The production of a margarine not inferior to butter in vitamines or accessory substances.

These problems require for their solution both chemical and physiological research, and successful results may only be expected if the chemist and the food physiologist work in close co-operation. Already a considerable amount of research has been undertaken on these subjects, with more or less success. It is not proposed, however, to deal with these researches in detail, but to review briefly each of the above-mentioned problems, indicating the present position and the prospects for the future.

Very little effective progress has yet been made towards the production of synthetic butter fat, chiefly on account of the uncertainty which still exists regarding the exact composition of the natural material. It may, it is true, be stated with tolerable certainty what fatty acids occur in butter fat, but whilst this information is of considerable value it is far from sufficient for the proper understanding of the constituents of the fat. It is well known that practically all naturally occurring fats consist of a mixture of various mixed glycerides, and that there are no effective methods now at the disposal of the chemist, by which all the mixed glycerides of a fat can be isolated or identified. Until some new method of fat analysis is discovered the production of synthetic butter fat, using the term synthetic in its strict sense, is impossible. On the other hand it is possible to obtain, by methods similar to those of Grün and his collaborators, a synthetic fat containing the same fatty acids combined with glycerine in the same proportions as in butter fat, but whilst these methods of synthesis are of considerable scientific interest they are of little or no commercial value. The discovery of an easy and reliable method of producing mixed glycerides of any desired composition would be a great advance and of considerable value to the margarine industry.

Another series of problems of interest in connexion with margarine manufacture arises from the use of milk in this industry. The maintenance of a regular supply of milk becomes increasingly difficult: moreover, the diversion of the milk supply from the channels of direct consumption involves some loss of food value and must be considered economically unsound. The discovery of a satisfactory substitute for milk would therefore be a great boon, not only to the margarine industry but also to the manufacture of dairy products, and research in this direction is likely to engage attention for some time to come. Perhaps, however, it will be found possible in the future to dispense altogether with milk, or milk substitutes, in the manufacture of margarine. Many objections may and will be raised against such a procedure, but they are not insuperable. It may be urged that the perfect diet must be adequate in proteins, carbohydrates, fats, salts and accessory substances, and that margarine made without milk will contain only a few of these essentials and be therefore inferior to margarine made with milk. This is perfectly true, but it is quite possible that, under some circumstances, greater economy might be effected by relying on margarine to supply the fatty constituents of the food, leaving the rest of the essentials to be supplied by other foodstuffs. In any case margarine produced without milk could easily be made to provide the salts and accessory substances, in addition to the fat, and there appears to be no reason why the proteins and carbohydrates should not be left to the rest of the diet.

The third problem outlined above, namely, the production of a butter flavour, is obviously of considerable commercial importance, although views may differ regarding its value as a contributor to the actual food value of a substance. It appears reasonable to suppose, however, that the main object of flavour in a food is to bring into operation, through the sense of taste, the "influence of mind on matter," thus producing favourable or unfavourable results on the digestive processes according to the type of flavour. For that reason the question of a suitable flavour acquires importance on scientific as well as on commercial grounds. A large volume of research has been published on the production of butter flavour by bacteriological methods and the results of these researches are being utilised, with more or less satisfactory

results, in the margarine industry. The successful production of a good flavour depends on the choice of a suitable bacillus developed under suitable conditions in milk. The question of milk supply, as already indicated, is not without its difficulties, and therefore the production of a flavour without the use of milk is an important problem. This might possibly be solved by synthetic means. However, very little is known regarding the chemical composition of butter flavour, chiefly on account of the great difficulty in obtaining it in tangible amounts for analysis. For success in this direction research is needed, first to perfect methods of identifying the components of butter flavour and then to devise processes for synthesising them.

A fourth problem attracting considerable attention in the margarine industry is the question of food value as affected by the presence or absence of accessory substances. Within the last few years it has been proved that the growth of animals cannot take place unless the food contains small proportions of certain ingredients, first known as vitamines, now more commonly termed accessory substances. The chemistry of these substances is still very obscure. Recent work shows that there are at least two accessory substances, one of which is water-soluble the other being fat-soluble. Butter fat and many animal fats are particularly rich in the latter, but it is absent from most vegetable oils. For that reason the use of vegetable oils in margarine manufacture has been adversely criticised on the ground that the consumption of such margarine is attended with risk of malnutrition and the contraction of the so-called deficiency diseases. The absence of accessory substances in vegetable oils should not, however, be regarded as a fatal objection to their use in food-products, no more than sugar, for example, should be condemned for a similar reason, since in a normal diet sufficient accessory substance will be supplied with the rest of the food. Nevertheless it is important that some portion of the diet should contain the required accessory substances, and a margarine which supplies them is obviously superior to an accessory-free margarine. It is therefore certain that research on accessory substances will be of great interest to the producer of margarine. At present there is need for a systematic examination of all well-known fats and oils for the detection of accessory substances. It is also of importance to devise good commercial methods of extracting them in concentrated form. The science of accessory substances is, however, only in its infancy and important developments may be expected in the future.

Such are a few of the problems the solution or the development of which would prove of value not only to a particular industry, but also to the nation in general.

COTTON SEED PRODUCTS AND THE CHEMICAL INDUSTRIES.

ERWIN W. THOMPSON.

Chemical industries are more often than not dependent for raw materials upon other industries not classed as strictly "chemical." Conversely, of course, many mechanical industries survive only because of their by-products, which are chemically developed. These mechanical and chemical industries (if one may make so rough a differentiation) are generally interdependent, by-products making the profits for the one and furnishing raw materials for the other.

Milling cotton seed, as conducted in England, consists primarily of a series of mechanical operations turning out crude oil and cake, but generally followed by chemical operations for refining the oil. Often the refining and further treating of the oil is conducted as a separate industry, which may be classed as chemical.

In its usual form, the refining process consists in neutralising the free fatty acids which always exist to a greater or less degree in crude cotton seed oil. Fundamentally, this refining is a most simple process: merely the agitation of the oil and heating with a solution of caustic soda. Practically, however, there is scope for unlimited exercise of chemical and mechanical knowledge and skill. A simple laboratory test will establish the exact percentage of uncombined fatty acid in a given lot of oil, from which may be calculated the total amount of caustic soda necessary to neutralise it.

Some of the points requiring special skill and experience are the decision upon the strength of solution to be used in a given case; the proper application of the solution to the large tank of oil to ensure intimate contact for the proper period of time and under proper temperatures at various stages of the process; correct sedimentation and separation to avoid loss of refined oil in the foots. The skilful refiner will use just enough alkali to be sure of perfect neutralisation and to bring about the proper colour of the refined oil. Careless work or improper mechanical equipment tend to the use of too much alkali, making an excessive refining loss, and imparting an alkaline flavour to the refined oil.

Assuming that a good grade of neutral oil has been produced having a proper merchantable colour, there is still much left to be desired in the matter of flavour, and if the oil is for edible purposes—its natural market—some process of deodorising must follow. As now conducted, this process consists essentially in blowing superheated steam through the oil and then rapidly cooling it. Several variations in method are employed, the general object apparently being to volatilise and carry away the small amounts of the comparatively little known substances which impart characteristic odour and flavour. There is room for great improvement both in method and result; for while many of the best deodorised oils are at ordinary temperature, bland and tasteless, when used pure or in compounds for frying, the best of them often give off disagreeable odours.

As the crude oil made from decorticated seed is much more easily refined and deodorised than the other, one step in the direction of making better edible oil might be to change present methods in the crude mill itself, and crush only the kernels (as is done in the United States) instead of the whole seed.

Oils intended for ingredients of artificial (compound) lard, are bleached, generally with fullers' earth, and sometimes hardened by the now well-known hydrogen process. Formerly artificial lard was made by the admixture of bleached liquid cotton-seed oil with oleo stock or refined tallow in the right proportion to give a consistency as nearly like lard as possible. But since the introduction of the hardening process, much of the artificial lard is made by mixing liquid with hardened cottonseed oil.

Margarine, or artificial butter, is in general compounded from the same kind of fats as used for artificial lard. Natural hard fats are more difficult to obtain and higher in price than liquid, so the artificially hardened fats have become immensely popular for all these mixtures, even whale oil having been so used during the war.

Ordinarily, soaps can profitably be made only from such fats as cannot be made marketable for edible purposes; to-day the Food Controller has severely rationed the soap trade and only allows the use by it of oils which cannot possibly be made edible.

One of the unsolved problems is to make properly edible the oil now expressed from Indian woolly seed. War requirements for fibre to make explosives have caused changes in American milling, looking toward a more intensive recovery of the short lint on the seed. When important quantities of Indian or other woolly seed are again worked in England, no doubt these seeds will be completely defibrated instead of being crushed whole along with the fibres, as heretofore.

After the war the acquired habits of conservation will probably persist; and notwithstanding the cessation of demand for short fibre for explosive purposes, this by-product will continue to be made for other uses, such as artificial silk and leather, and cellulose acetate and the numerous other derivatives.

To summarise, the chemistry of the production and utilisation of vegetable oils is susceptible of expansion in several interesting and profitable directions:—

(1) Extracting oil by solvent processes, which will make greater yields and yet not extract deleterious substances along with the oil, and which will not be subject to great fire risk.

(2) Treating the residue (cake) to free it from all traces of the solvent, to make it a proper cattle feed.

(3) Refining oils by methods causing least possible loss, and producing the highest grades of edible oils, tasteless and odourless, both liquid and solid.

(4) Utilising the by-products of refining to the best advantage to recover the fatty acids free from objectionable colour and from foreign matter; and the further transformation of the finished products into the finest soaps and other useful merchandise.

(5) Making cotton seed flour and bread therefrom that will be an acceptable and merchantable product.

(6) Treatment of recovered fibre to make an infinite variety of profitable merchandise.

WOOD PULP AND PAPER-MAKING MATERIALS.

The following items were given by R. W. Sindall in a lecture recently delivered at the London School of Economics. They are of particular interest at the present time as the statistical information contained therein illustrates the effect of the war on the paper industry of the United Kingdom.

The only official figures for the production of paper in this country are those given in the Census of Production (Cd. 6320 of session 1912, published by H.M. Stationery Office, 1913) for the Censal year 1907. These figures are already ten years old, but the publication of later reports has been interrupted by the war. Accurate returns from all the mills are very difficult to obtain but the approximate total for the year 1907 was 850,000—900,000 tons of all kinds, value about £13,600,000. The Board of Trade Returns for the external trade in paper and paper-making materials, however, have been kept up to date with a very considerable degree of accuracy and completeness of detail, and the imports of raw materials during the last five years are summarised in Table I, which shows the great fall produced by war conditions.

The large increase in the quantity of dry mechanical pulp and the shrinkage in that of moist wood pulps and esparto for the year 1917 reflect the influence of the restriction of tonnage on the class of materials imported from abroad.

In default of official statistics for the production of paper during the war period, the lecturer has calculated the quantity of paper which could be manufactured form the imported raw materials, according to the approximately known yields of each, and the results are tabulated for the two typical years 1914 and 1917.

Table II.—Quantity of paper obtainable from imported raw materials.

Material.	Yield of paper.	Quantity of paper obtainable.	
		1914.	1917.
	%	tons.	tons.
Linen and cotton rags	75	16,668	1,600
Esparto and other vegetable fibres	40	73,257	22,790
Chemical wood pulp, dry, bleached................	100	18,681	20,783
Chemical wood pulp, dry, unbleached	100	396,399	142,008
Chemical wood pulp, wet ..	50	9,080	4,175
Mechanical wood pulp, dry	100	5,625	41,186
Mechanical wood pulp, wet	50	275,704	87,282
Other materials	50	5,919	70
Total tons	—	801,333	319,894
Total yield		66%	71%

It would be decidedly interesting to add to these figures the estimated quantities of paper to be credited to raw materials of home production. From indirect indications it would appear that, before the war, this source accounted for about 200,000—250,000 tons of paper, and since the war it must have increased substantially owing to the prohibition of the export of rags and other wastes, including waste papers, and to the utilisation of a certain amount of home-grown straw. Thus it might be roughly estimated that the manufacture of paper in this country has been reduced from about 1,050,000 tons in 1914 to about 600,000—650,000 tons in 1917.

Table I.—Imports of paper-making materials, 1913—1917.

Material.	1913*.	1914.	1915.	1916.	1917.
	tons.	tons.	tons.	tons.	tons.
Linen and cotton rags	29,538	22,224	11,139	4,776	2,132
Esparto and other vegetable fibres	204,957	183,144	137,538	148,851	56,976
Wood pulp, chemical, dry, bleached	20,621	18,681	30,254	20,083	20,783
" " " Unbleached	374,684	396,399	362,513	158,768	142,008
" " wet	16,498	18,159	10,074	19,914	8,350
" mechanical, dry	8,967	5,625	10,472	7,780	41,186
" mechanical, wet	556,987	551,408	540,737	451,537	174,564
Other materials..........	16,898	11,838	3,634	1,417	139
Total tons	1,229,150	1,207,478	1,106,361	813,126	446,138

* 1913.—Highest year before the war.

Wood pulp is, and must always remain, the staple raw material of the world's paper supplies. Figures are given (based, possibly, on Krawany's estimates) showing the production of wood pulps in the principal countries for the year 1908.

Table III.—Annual production of wood pulp for the year 1908.

Country.	Mechanical pulp (air dry basis).	Chemical pulp (air dry bass).	Total.
	tons.	tons.	tons.
Germany ..	315,000	320,000	635,000
Norway	421,000	270,000	691,000
Sweden	78,000	510,000	588,000
Finland	69,000	52,000	121,000
United States	868,000	988,000	1,856,000
Canada	565,000	172,000	737,000
Total	2,316,000	2,312,000	4,628,000

These ten-year-old figures, as the lecturer pointed out, are now subject to considerable revision; large increases have to be recorded for Canada, the United States and Scandinavia. A recent return shows the total production of the United States for 1916 to be 2,920,812 English tons.

Statistics compiled from information given in the Scandinavian Trade Directories give the following distribution of production of the various kinds of wood pulp in Norway and Sweden for the year 1915:—

Table IV.—Scandinavian production. Year 1915.

Kind of pulp.	Total.	Norway.	Sweden.
	tons.	tons.	tons.
Mechanical, wet	984,100	693,100	291,000
Mechanical, dry	85,800	25,000	60,800
Sulphite, bleaching	259,000	97,000	162,000
Sulphite, strong	468,400	28,400	440,000
Soda, bleaching	80,200	—	80,200
Soda, Kraft	137,000	27,500	109,500
Sulphite, bleached	153,700	104,000	49,700
Soda, bleached	13,000	—	13,000
Total	2,181,200	975,000	1,206,200

As regards Canada, the development of the industry is also very marked, with a growing tendency to manufacture wood pulp in the country rather than to export pulp-wood for manufacture in the United States. The official returns for the production of wood pulp in Canada for the year 1915 show a total of 1,074,805 tons distributed as follows:—

Mechanical pulp........	743,776	tons (air dry basis).
Sulphite pulp	235,474	,, ,, ,,
Sulphate pulp..........	92,405	,, ,, ,,
Soda pulp	3,150	,, ,, ,,

Messrs. Becker and Co. record a prospective increase during 1918 over the 1915 figures of about 300,000 tons, as the result of operations set in motion to extend the supply of chemical pulp produced in the British Empire. Thus, the total production of Canada for the year 1918 is expected to amount to close on 1,400,000 tons.

Canada, is, indeed, the richest forest area in the world, as is shown by the following table compiled by Schlich:—

Table V.—Available forest areas of different countries.

Country.	Acres (millions).	Country.	Acres (millions).
Canada	800	Spain	21
United States ..	400	Norway	17
Russia	500	France..........	23
Austria-Hungary	46	Italy	10
Germany	35	Roumania	5
Sweden	49	Great Britain	3

Apart from virgin forests, an average yield of 10 cords per acre may be allowed, with careful cutting and re-planting, and a forty years' rotation is the rule. A cord of trimmed logs is a pile 4 ft. × 4 ft. × 8 ft. (128 cub. ft.) and, on an average, one ton of mechanical pulp requires $1\frac{1}{4}$ cord of wood and one ton of chemical pulp $2\frac{1}{4}$ cords.

The lecturer dealt at length with the comparatively unexploited materials other than wood, some of which might be brought into service if the supply of pulp-wood became seriously restricted. Any substitution of this order will be likely to affect chemical wood pulp only, as no effective substitute for mechanical wood pulp is in sight. Moreover, owing to the higher yield of pulp obtained mechanically, the substitution of chemical wood pulp by other materials is economically more justified.

NEWS FROM THE SECTIONS.

BIRMINGHAM.

A meeting of the Birmingham and Midland Section was held at the University Buildings, Birmingham, on April 18, Dr. R. S. Morrell presiding.

A note on the "Discoloration of White Paint" was read by Dr. D. F. Twiss, who pointed out that in the use of a white "enamel" of good quality, trouble was experienced in the tendency of the dried films to undergo discoloration, especially when articles painted with it were stored in a warm place. The transition from white to a yellow-brown colour took place whether the painted surface were exposed to daylight or kept in the dark, and the discoloration appeared to be mainly confined to the surface layers. The change in colour of an enamel made with zinc oxide and oil was not due to the interaction of impurities, *e.g.*, lithopone, with lead compounds also present. The evidence indicated that the discoloration was mainly due to the medium and not to the pigment. A little of the former separated from the mixture developed a brown colour, and linseed oil, free from "gum," underwent a similar change. Poppy seed oil showed less tendency to alter. The discoloration of linseed oil was masked more effectively by white lead than by zinc oxide; it was apparently independent of oxidation and polymerisation, and probably a minor ingredient other than the glyceride mixture was the cause of the trouble.

Dr. Morrell followed with a note on "Isomeric Changes in Drying Oils." In continuation of the investigation of the properties of thickened drying oils, Chinese wood oil was examined according to the methods described in a former paper (this J., 1915, 35, 105). The object of the work was to search for changes in atomic linkings which may have occurred as a result of heating the oil, and the conclusion drawn was that polymerisation of wood oil occurs without linkage changes, but that stereo-isomeric changes take place when the methyl esters are distilled. This conclusion is at variance with the suggestions made in the previous paper (*loc. cit.*), but the conditions of experimenting were not comparable. The properties of drying oils are so largely dependent on the number and position of the doubly linked carbon atoms that the author considered that investigation of any evidence of linkage changes was of considerable importance.

A note on "A Rapid Routine Estimation of Zinc in Aluminium Alloys" was submitted by Mr. A. W. Willis. The method consists in treating the alloy with caustic soda to dissolve zinc and aluminium, filtering, precipitating (hot) the zinc with hydrogen sulphide, and subsequent titration with potassium ferrocyanide.

The subject of "The Works Chemist and his Relation to Buying" was introduced by Mr.

E. R. Canning. It was often said that the chemist was lacking in business ability, but this was not always his fault—the opportunity did not come to him. Satisfactory buying could not be carried on without the co-operation of the chemist, and both works managers and foremen needed his advice. The best means of breaking down the high prices of proprietary articles was to consult the chemist as to their composition and true value. Inquiries should not be sent out couched in scientific language.

Dr. Morrell thought it desirable that works managers and foremen should have some acquaintance with chemistry; and that chemists should be able to make rapid tests of articles submitted. Mr. E. W. Smith deplored the tendency to employ underpaid chemists, and advocated free time for scientific study for all junior chemists. Mr. F. Lantsberry espied danger in expecting chemists to have commercial knowledge, as their knowledge of their own subject might suffer thereby. Rapid estimations should not be entrusted to men without adequate chemical training. Mr. F. R. O'Shaughnessy regretted that chemists were rated so low by commercial men in Birmingham, as one consequence of which large quantities of valuable acid and metals were allowed to run to waste. Mr. T. F. E. Rhead urged the necessity of every chemist being conversant with the cost of materials and plant with which he worked; and Mr. F. H. Alcock emphasised the point that the reputation of chemists suffered because analyses were put into the hands of incompetent men.

NOTTINGHAM.

The following were the chief items on the agenda at the meeting on April 24: 1. "The Influence of Small Quantities of some Metallic Elements on the Mechanical Properties of Brass," by E. Millington. 2. "The Viscosity of Volatile Liquids as determined by the Mercurial Viscometer," by F. M. Lidstone. 3. "Bleaching and Dyeing under War Conditions." A discussion opened by S. J. Pentecost.

The purpose of the work described in Mr. Millington's paper was to provide data, expressed diagrammatically according to the principles of the phase-rule, by reference to which the effect upon brass of small quantities of tin, iron, manganese and aluminium might be known, so that alloys possessing certain desired properties could be made by mixing the constituent metals in determined proportions. Microscopic examination of the solidified alloys showed that as many as four solid phases, α, β, γ, δ, might exist; the α- and β-phases were characterised by ductility and strength, whilst the γ- and δ-phases were deficient in these properties. Consequently the object of the metallurgist must be to reinforce the α- and β-phases by the addition of other metals to the brass, and as far as possible by this means eliminate the γ- and δ-phases, which, occurring together, are called the "blue constituent." Incidentally, the great effect of small quantities of added metals was noted; this was especially the case with tin.

Mr. Lidstone described a modification of his viscometer (this J., 1917, 36, 270—272) designed to determine the viscosity of volatile liquids of appreciable vapour pressures at experimental temperatures. This consisted of a head of mercury, which by its pressure prevented the formation of a cushion of vapours above the liquid. A correction of the formula previously given for the instrument was made.

In opening the discussion on Bleaching and Dyeing, Mr. S. J. Pentecost said that bleaching had suffered through the Government's withdrawal of sulphuric acid, and the substitution for it of nitre-cake. The latter always contained more or less iron, and if its solution became neutralised during use it was precipitated in the fabric causing coloration and tendering. Other sources of trouble were scarcity of soap and of bleaching powder. Lack of the latter reagent had led to the use of a soda-bleach made by electrolysing salt solutions. This was cleanly, but rather dearer than bleaching powder. The question of its extended use might form a subject for research. The shortage of dyes became acute in 1916, when the German stocks were exhausted; but since then magnificent progress had been made by British dye-firms. Mr. Pentecost described the streets of factories devoted to the manufacture of intermediates or dyes themselves now existing in Yorkshire, Lancashire and Cheshire, and said that every praise was due to British chemists who had achieved so much in so short a time.

Two things were still necessary: more capital and greater unity. America is spending more, and in Germany there is one great combine with a capital of 57 millions. References were made to the help of the Swiss in one emergency, and to the local manufacture and use of aniline black.

Dr. Hedley said that the cost of electrolytic bleaching was chiefly one of freightage, and referred to the deposition of calcium sulphate in the fabric when bleaching powder was used with sulphuric acid, and hence the superiority of sodium hypochlorite on account of solubility.

LIVERPOOL.

The Annual General Meeting was held on April 26 at the University; Mr. John Gray was in the chair (Mr. A. T. Smith being unavoidably absent).

The Secretary (Dr. A. Holt) gave particulars of the new Catalogue of Scientific Journals in course of preparation under his direction for the Society; he then introduced to the notice of the members present the preliminary announcement of the proposed National Union of Scientific Workers, and said that in view of a forthcoming local sectional meeting of that provisional body, the feeling (if any) of the Liverpool Section of the Society of Chemical Industry towards the proposed Union might be ascertained.

After some other speakers had contributed their views, Dr. Holt said he thought that the N.U.S.W. did not affect the corporate interests of the Liverpool Section of the Society, but if any member was interested, he could act in his individual capacity in regard to the Union.

Mr. G. Carruthers Thompson then read a paper entitled "The Action of Water on Some Halogen Derivatives of the Fatty Acids."

The products obtained by addition of the halogen acids to the unsaturated fatty acids are all easily decomposed by boiling with water. Two reactions may take place, either the halogen acid splits off and the original, or an isomeric, unsaturated acid is obtained; or the halogen will be replaced by the hydroxyl group and an oxy-acid will be formed. That both these reactions take place was observed some years ago by the author and also by Fittig and his pupils. Thus on boiling with water, monochloracetic acid gave glycollic acid; α-bromopropionic acid gave lactic acid; β-iodopropionic acid gave hydracrylic acid as chief product, together with a much smaller amount of acrylic acid; monobrombutyric acid gave chiefly α-oxybutyric acid; and monobrom-isobutyric acid gave much oxyisobutyric acid and a small yield of methacrylic acid. As the quantity of unsaturated acids formed in the secondary reactions is so small, the above is an easy method of preparing the oxy-acids.

OFFICIAL NOTICES OF THE SOCIETY.

AWARD OF SOCIETY'S MEDAL.

In accordance with the provisions of By-law 72, notice is hereby given that the Council has awarded the Society's Medal to Sir James Dewar, F.R.S., in recognition of the conspicuous services which, by his research work in both pure and applied science, he has rendered to chemical industry.

ANNUAL GENERAL MEETING, 1918.

In accordance with the provisions of By-law 64, notice is hereby given that the Annual General Meeting will be held in the University Buildings, Bristol, on Wednesday, July 17, 1918, at 10.30 a.m. The programme of the proceedings will be issued later.

In accordance with the provisions of By-law 24, those members whose names are printed in *italics* in the List of Council will retire from their respective offices at the forthcoming Annual Meeting.

Prof. Henry Louis has been nominated to the office of President, under By-law 20; Dr. E. F. Armstrong, Prof. W. R. Hodgkinson, Mr. R. L. Mond, and Mr. W. F. Reid have been nominated Vice-Presidents under By-law 21; and Mr. D. Lloyd Howard, and Dr. R. Messel, F.R.S., have been re-appointed Honorary Treasurer and Honorary Foreign Secretary respectively.

Members are requested to nominate on or before May 21 next, fit and proper persons to fill the four vacancies among the ordinary Members of Council. Forms for this purpose can be obtained from the Secretary of the Society.

By-law 23.—An ordinary Member of Council shall be nominated by ten or more members upon Form B in the Schedule, a copy of which form shall be furnished by the Secretary upon the written or verbal request of any member, but a member shall not be eligible to sign more than one such nomination form, and the member nominated shall sign the declaration set forth on the form.

A nomination shall be declared invalid by the Council if :—

(A) The member thereon nominated is disqualified for election, or ineligible to be elected, as provided by the By-laws.

(B) The nomination is not made on the authorised printed form or substantially not in the manner directed thereon.

(C) The nomination form is signed by less than ten members not disqualified or not ineligible to nominate as provided by the By-laws.

(D) The nomination form is not received before or upon the day appointed therefor.

(E) The member nominated has not signed the declaration printed upon the form.

A member whose nomination aforesaid is declared to be invalid, shall receive notice thereof from the Secretary, and shall not be submitted for election.

J. P. LONGSTAFF,
Secretary.

PERSONALIA.

Professor A. R. Cushny, of University College, London, has been appointed to the Chair of Materia Medica at Edinburgh University.

The Chemical Division of the Inspection Department, Ministry of Munitions, has been reorganised as a Directorate. Mr. G. H. Perry has been appointed Director of Chemical Inspection. Mr. O. Trigger has been appointed Technical Adviser to the Directorate with the rank of Inspector, and Messrs. F. G. Edmed and A. Y. Elsden have been appointed Inspectors in the Explosives and General Sections respectively.

THE FUTURE OF PURE AND APPLIED CHEMISTRY.

ABSTRACT OF THE PRESIDENTIAL ADDRESS TO THE CHEMICAL SOCIETY BY PROF. W. J. POPE.

Chemical research has been dormant for three years, but meanwhile our mental outlook has changed, and from an obscure and painful present we see the promise of a brilliant future for our science. It has often been stated, especially by Germans, that the British nation cannot excel in chemistry, and particularly in applied organic chemistry, because of the necessary attention to detail, organisation, and co-operation, which is not a British characteristic. The events of the past three years have entirely dissipated this fallacy; for since the autumn of 1914 Great Britain has become a larger producer of explosive, pharmaceutical, photographic, and other essential chemicals than Germany, and this in spite of the fact that science has no voice in our representative Government.

The work of Dalton, Thomas Young, and James Watt has influenced our well-being far more than the Napoleonic wars, though the battle of Trafalgar is commonly thought of as the most pregnant event of the first quarter of the nineteenth century. Davy's discovery of sodium, and Faraday's of benzene, which led to that of artificial indigo, Perkin's mauve, synthetic alizarin, Faraday's electrical work, Cavendish's sparking of air which has provided Central Europe with explosives—nearly all these discoveries with their profound influence on European history, were made within a few hundred yards of Burlington House.

Chemical science is still furnishing the means for revolutionary changes, and the whole Empire is one vast chemical and engineering laboratory. Scientific men must prevent reversion to the old order, with its neglect of science which leads to national downfall. Science must make her voice heard in the councils of the nation, and drifting must be arrested.

The Chemical Society, the Society of Chemical Industry, and the Institute of Chemistry, together perhaps with the Association of British Chemical Manufacturers, should set up an alert, joint Council to watch the varied national questions in which chemistry is concerned, and make united representations of their views to our administrators. If such a body had been in existence several years ago much that has been accomplished would have been better done. The coal-tar industry, for example, would not have been revived without scientific advice, nor its directorate constituted without scientific men, for fear these would have an advantage over their less well-informed colleagues. Chemists may be partly to blame for recent official blunders, because they have no strong collective Council which might approach the Government; and the resources of chemistry should be immediately organised so that it may be possible to enforce the adoption of scientific methods by the authorities to whom these methods are yet strange.

The British coal-tar industry is a key-industry because upon it depend the textile, paper, photographic and pharmaceutical industries; yet the total capital employed in this industry is between four and five million pounds, whilst the capital of the German coal-tar colour firms is something like fifty millions. That Great Britain has failed to realise the alluring prophecy of Prof. A. W. von Hofmann with regard to coal-tar colours is attributable to the fact that we have indolently permitted the control of our educational interests to pass into the hands of those who despise a first-hand knowledge of the facts of natural science, preferring an evanescent acquaintance with the classics, and a taste for learned leisure.

The scientific man can appreciate fine literature, although the literary man denies his power of effective expression. The latter might, therefore, profitably devote his faculties to the popularisation of the scientific discoveries of the past two centuries so as to provide the young with an education embracing present-day knowledge of the universe. Unfortunately the caste of classics still holds sway, and natural science disqualifies for high public office: practically all the superior positions in the Civil and Diplomatic Services are still filled by men of classical instincts. Experience of the last four years shows that public criticism falls on administrative Government Departments staffed by classical men, rather than on the newer Departments where scientifically-trained men are employed. The home Army Medical Service, for example, has never been charged with inefficiency, and it is uncontrolled by the classical *régime* because of the collective organisation possessed by medicine.

Our power to excel in the fine organic chemical industry is shown by our recent production of sensitised dyes for panchromatic photographic plates. These dyes render the plates sensitive to the green, yellow, and red parts of the spectrum, and are essential for aerial photography. The world's consumption of these products normally amounts to only a few pounds per annum, and until 1915 Central Europe monopolised their manufacture. The subject was investigated in this country when the need arose, and within a few months ample supplies of the usual sensitisers were forthcoming; and further, as the result of financial help from the recently established Department of Scientific and Industrial Research, new and far superior sensitising dyes have been produced. It may indeed be asserted that the manufacture of panchromatic plates has now attained to a degree of perfection in this country that will long defy competition. This is one illustration of the fact that British chemistry is capable of meeting every demand that can be made upon it in the future period of reconstruction.

The teaching staffs of our Universities have, however, been depleted during several years, and only a small fraction of the normal number of men students have presented themselves for training. The present supply of young chemists is inadequate, and the outlook for the future is still more serious. Five years must elapse from the time hostilities cease before a sufficient number of young British chemists will be available for the fine chemical industry of this country. If chemists are imported from neutral countries care must be taken not to handicap our native talent.

There are various signs of awakening among the younger members of the chemical profession, and a number of proposals have been made for the formation of new societies, not all of which appeal to more experienced chemists. A central organisation, such as the Chemists' Club in New York, with facilities for hospitality, meetings, library and laboratory accommodation, would obviate the need for creating new and separate bodies. Branches of the main organisation might be formed from time to time, and these would be a source of strength. A central home is required with premises several times as large as the Chemical Society's Rooms, for use as a club of which every chemist in the country would be a member.

Far more must be done in the future to facilitate the entrance of talented young men into the scientific professions, if Great Britain is to regain her once paramount position in scientific discovery. The Universities must be expanded as regards staff, equipment, and provision for research; and scholarships must provide opportunity for the complete training of the best students.

The intellectual professions are either productive or parasitic. The latter command ample remuneration, which is at present denied to the former. If science is to retain in its service a sufficient proportion of intellectual and creative talent, appropriate emoluments must be provided. Moreover, pure science must not be neglected; unproductive research must receive its full reward; and no material interests must be allowed to check the stupendous development of natural knowledge which is now taking place.

MEETINGS OF OTHER SOCIETIES.

ROYAL INSTITUTION.

The Friday Evening Discourse on April 12 last was given by Prof. E. C. C. Baly on "Absorption and Phosphorescence."

By the terms absorption and phosphorescent is meant the selective absorption or emission of radiant energy as differentiated from that shown by the black body. Under the name phosphorescence are included all the phenomena usually known in this country as those of fluorescence as well as phosphorescence. The reason for this is that it has become increasingly difficult to draw a distinction between the two.

By measuring the absorptive power and emissive power exhibited by a phosphorescent substance over the region covered by the absorption and phosphorescence bands, it is possible to draw the curves expressing the relation between the oscillation frequency of the radiant energy and the absorptive and emissive powers. These two curves are found frequently to overlap and, as any ray lying within the absorption band region is capable of exciting the whole of the phosphorescence, it might seem that Stokes' law is contradicted. This, however, is incorrect for the law refers to the maxima of absorption and phosphorescence only.

In the case of a substance exhibiting several absorption and phosphorescence maxima it is found that the frequency differences between the central lines of these bands are constant, or simple multiples of a constant. Again, this frequency difference is equal to the frequency of an important vibration frequency exhibited by that substance in the short wave infra-red. It follows from this that every substance possesses a fundamental vibration frequency in the short wave infra-red and the multiples of this form free vibration periods in the visible and ultra-violet regions of the spectrum. Which of these free periods are called into play and exhibit themselves as absorption or phosphorescence bands depends upon the conditions under which the substance exists. It is found for example that different periods may be rendered active by the use of different solvents.

If a given absorption or phosphorescence band is examined under high resolving power it is resolved in general into a series of sub-groups symmetrically arranged round a central sub-group. Again, each sub-group can be resolved into series of fine lines symmetrically arranged round a central line. Further, there is a constant frequency difference between the successive sub-groups and moreover the constituent lines in any sub-group also show constant frequency differences. The complete relation between these constant frequency differences can best be understood by the consideration of a specific compound as for example sulphur dioxide. In this case there are two ultra-violet absorption bands and these show three series of sub-groups, and the constant differences of these three series expressed in reciprocal wave lengths are 11·79, 22·32, and 35·32 respectively. In the case of the constituent line series there are apparently three of these with constant differences of 2·73, 4·32, and 8·18 respectively.

It would seem that one of the most important relationships is given by—

$$2{\cdot}73 \times 4{\cdot}32 = 11{\cdot}79.$$
$$2{\cdot}73 \times 8{\cdot}18 = 22{\cdot}32.$$
$$4{\cdot}32 \times 8{\cdot}18 = 35{\cdot}32.$$

Expressed in words—the constant frequency differences between the successive sub-groups are the least common multiples of the constant frequency differences of their constituent line series.

Then again, the least common multiple of the three line differences, $2{\cdot}73 \times 4{\cdot}32 \times 8{\cdot}18 = 96{\cdot}43$, is the basis of the molecular frequencies of sulphur dioxide, since the central wave numbers of all the absorption bands of sulphur dioxide measured in the infra-red are multiples of 96·43. There are six absorption bands and their central wave numbers are given by $96{\cdot}43 \times 10$, 12, 14, 18, 26, and 33, respectively.

The relationship becomes still more interesting when it is realised that the wave number 8·18 is characteristic of the oxygen atom, and the wave numbers 2·73 and 4·32 are characteristic of the sulphur atom. For the general conclusion may be drawn that the whole of the vibration periods of sulphur dioxide are derived from those of the oxygn and sulphur atoms it contains.

The whole relationship may be summed up as follows—the elementary atoms in a molecule have their own fundamental vibration frequencies in the long wave infra-red. The least common multiple of all these frequencies which are active forms the fundamental vibration frequency of the molecule, that is to say the central frequency of the absorption and phosphorescence bands shown by the molecule are multiples of this least common multiple. The central frequencies combined with the atomic frequencies give rise to the component lines and sub-groups in each absorption and phosphorescence band.

THE CERAMIC SOCIETY.

At a meeting held at Stoke-on-Trent, on April 13, a paper was read by Mr. B. Moore on "The Bending of Easy-Fired Ware."

A pottery body consists essentially of an infusible framework and a fusible flux or matrix. Substances like earthenware are usually low in the matrix and high in the framework, but with others, like porcelain, this relation is reversed. Chemical analysis gives no clue as to which of these types the body belongs. During firing, the melted matrix gradually dissolves clay, and by the time it is saturated the maximum contraction has generally taken place. The author then quoted experiments illustrating the appreciable influence of external conditions upon contraction.

Though the matrix generally becomes more infusible as it dissolves more of the ingredients, it may happen that eutectics, or something analogous to eutectics, are formed. Felspar, the most common flux, melts at about 1250° C., but it may combine with a less fusible material, such as sand, to form a more fusible product.

Early and steady vitrification of the matrix may be of great advantage because it may bring about the proper contraction and make satisfactory ware at a lower temperature, with correspondingly less risk of the framework becoming deformed. Abnormally slow vitrification in the early stages followed by rapid vitrification at the end is risky.

The infusible framework consists mainly of what was clay. In an ordinary pottery body there is another matrix which is intimately mixed with the infusible framework. This consists of the finely divided and more or less fusible materials which are naturally mixed intimately with the true clay, especially in ball clays, vitrifiable fireclays, and strong china clays. It is the vitrification of the clay caused by the very finely divided flux that gives strength and ring to a body, and the same result is never obtained by means of artificial mixtures. It is also the matrix of the framework which produces the so-called bending point of fireclays under load.

Further points dealt with were: the effect of different methods of mixing the ingredients, and the influence of fine grinding upon the speed of vitrification and upon the melting point of mixtures.

SOCIETY OF DYERS AND COLOURISTS.

At the meeting of the Manchester Section on April 19, a paper entitled "A Study of the Oxidation of Linseed Oil" by G. E. Holden and L. G. Radcliffe was read by the latter. Mr. Pennington was in the chair, and later Prof. Knecht.

The authors described a method for ascertaining the increase in weight sustained by linseed oil on drying, in which the oil was spread on cotton cloth and exposed to a current of air. The pieces of oiled cloth were contained in gas jars connected in series and were weighed at intervals. It was found that the rate of absorption of oxygen was greatest in the first jar, and diminished in each successive jar. On heating the dried oil samples to 100° C., the previous gain of 17—18 per cent. (for all samples after prolonged treatment) was reduced to 1·0—3·5 per cent. Decomposition of the non-drying bodies in raw linseed oil is much accelerated by heat. The rosinates and linoleates of lead and manganese, dissolved in the oil, behave alike in drying power, but about six times as much metallic lead as manganese is needed to attain equivalent drying efficiency. Investigating the effects of diluents, it was found that only in the case of turpentine was the rate of drying slightly accelerated. Speed of drying increases with the iodine value, and is much accelerated by light and by heat independently. The ultimate decomposition of a film of linseed oil is apparently due to the decomposition and emanation of the non-drying substances associated with the film of linoxyn; and the better durability exhibited by a film dried at a high temperature is due to the quicker removal of these non-drying constituents by the heat, before the linoxyn is formed. A proportion of the non-drying substances evolved by heat is of an oily nature.

SOCIETY OF GLASS TECHNOLOGY.

The annual general meeting was held on April 17, in the University of Sheffield, the president, Mr. W. F. J. Wood, occupying the chair.

In his presidential address, Mr. Wood compared the present state of the glass industry in this country with its condition before the war; he classified the industry into eight manufacturing sections, and reviewed briefly the position and prospects of each. Most sections of the industry, particularly that devoted to the production of electric bulbs, are making good progress, but they need "nursing" and in most cases a protective tariff should be imposed. Mr. Wood then appealed for co-operation between masters and men, and between the different sections of the trade; he also acknowledged the value of the assistance given by the Ministry of Munitions, the Board of Trade and the Glass Technology Department of Sheffield University.

The needs of the glass industry as regards raw materials were then discussed, and data were presented showing the annual consumption. The concluding portion of the address dealt with devitrification ("dogging"). Whilst the formation of "dog" (chiefly calcium silicate) in a furnace is

in so far good as it serves to protect the bottom, excess is very bad as it causes many difficulties and leads to great losses in output. The two best methods of preventing it are, (1) to increase the proportion of alkali in the batch, and (2) to increase the proportion of alumina. The second method is preferable as increased alkali causes corrosion of the sides and roof of the tank and the formation of a less durable glass; increased alumina, on the other hand, produces a more durable glass. For dark glass bottles the alumina may be added as ground red brick (5—6 parts per 100 of batch); for light green bottle glass, ground felspar is to be preferred.

Mr. G. V. Wilson then read a paper entitled "Notes on the Formation of certain Rock-forming Minerals in and about a Glass Furnace." The author showed by means of microscopic and lantern slides the formation of various types of crystals in glass, and then dealt with the effect of heat upon glass pots and furnace blocks. A full treatment of the various changes was given and parallels with natural processes were drawn. Many of the results given should be of first-rate importance when applied to works' practice.

WEST OF SCOTLAND IRON AND STEEL INSTITUTE.

The last meeting of the present session was held in the Technical College, Glasgow, on April 26, when officers for the session 1918—19 were elected, Mr. M. L. Simpson succeeding Mr. H. Beard as president. A paper on welding was then read by Mr. W. H. Cathcart. The lecturer dealt with true welds and not with the process of autogenous soldering, often miscalled welding. He showed especially how necessary it is that the smith should be well acquainted with the properties of the steel he is about to weld, if he is to avoid burning or otherwise injuring the steel. It was also shown that the general principles of the iron-carbon equilibrium diagram could be made intelligible to the smith, and the relation between coarseness or fineness of grain and temperature of heating was explained.

COKE OVEN MANAGERS' ASSOCIATION.

In a paper on "Benzol Rectification" before the Midland Section of this Association at Sheffield on April 27, Mr. J. D. Hamer, of the Middleton Colliery, Leeds, spoke upon the continuous type of steam benzol plant now in general use. He condemned as wasteful those plants in which the absorbing oil is allowed to lose heat in its passage through the system, and he commended an improvement introduced by Messrs. Simon-Carves and Brown which provides a heating arrangement inside the still, so that the oil actually gains in heat during the process of debenzolisation. He also spoke favourably of Dr. Gasser's system, and of that lately devised by Mr. Wm. Greaves of Leeds in which a coil is heated by hot gases from direct firing. Where there is no provision against loss of heat the wash-oil should leave the indirect steam heating apparatus within 10° C. of the steam temperature; otherwise the provision for pre-heating and super-heating is inefficient, and an excessive consumption of direct steam in the still may be expected. If the oil is sufficiently hot when it enters the still, the quality of the crude benzol is regulated by the direct steam admitted and by the dephlegmating devices. The latter should have latitude enough to be independent of the heat-exchanging system, and there should be adequate provision for preventing the dephlegmated light oil, naphthalene and water of condensation from going back to the still. At some works the "once-run" benzol was separated into three fractions for separate washing, thereby economising sulphuric acid, a plan which involved the greatest care being taken to separate the forerunnings, and to mix judiciously the fractions before washing. If the primary still was worked slowly for the forerunnings, and the water overflow of the analyser was at least 10° lower than the normal reading for the benzol fraction, it would be found that a large proportion of the unsaturated hydrocarbons and carbon bisulphide would be removed. If provision had been made for the separation of the "once-run" products into four or five fractions, and there were efficient columns and analysers on both the primary and secondary stills, the plant was well adapted to make pure products. For the removal of thiophene from such products (besides the general method of continued washing with sulphuric acid) the author suggested treating the benzene with sufficient chlorine to combine only with thiophene in the cold, chlorine having a much greater affinity for thiophene than for benzene. The chloro compounds of thiophene and thiotolene have much higher boiling points than those of benzene and toluene, and are therefore easily separated from them by distillation.

SOCIETY OF PUBLIC ANALYSTS.

At the meeting held on May 1, Dr. S. Rideal in the chair, the following papers were read:—

(1) "Factors affecting the Composition of Plant Ashes, with Special Reference to Tobacco," by O. D. Roberts.

(2) "The Effect of Codeine in hindering the Precipitation of Morphine by Ammonia from a Solution of its Lime Compound," by H. E. Annett and H. Singh.

(3) "Analysis of 'Cocoa Teas.'" by Julian L. Baker and H. F. E. Hulton.

(4) "The Estimation of Shell in Cocoa and Cocoa Products," by Julian F. Baker and H. F. E. Hulton.

(1) The author has shown that appreciable amounts of sulphur and chlorine are lost during the incineration of tobacco by ordinary methods; and processes were given for overcoming inaccuracies in plant ash analyses due to carbon dioxide, and the presence in plants of both organic and inorganic chlorine, sulphur, and phosphorus.

(2) The author showed that Indian opiums when assayed by the process recommended in the British Pharmacopœia give results that are apparently low. They attribute the cause to the high codeine content of these opiums, and suggest a modification of the process by extracting the lime solution of the opium with toluene. Tables were given contrasting the results obtained by the original and modified methods.

(3) "Cocoa shells," sold either under their own or fancy names, are among the various food substitutes at present sold in this country. These shells are separated from the cocoa beans after roasting, and if sold as "shells" and at such a price as is reasonable compared with their wholesale value, there can be no objection to their use, the present wholesale price being 2d. or 3d. per lb. The authors gave a table showing analyses and retail prices of various brands.

(4) The authors indicated the difficulties which confront chemists in estimating the small quantities of shell in the grades of cocoa mentioned in the Cocoa Order of 1918. Grade A is to contain not more than 2 per cent., and Grade B not more than 5 per cent. of shell. It was pointed out that the available methods of estimating shell are not sufficiently accurate to differentiate between Grades A and B.

The methods of estimating shell in cocoa were discussed, and a considerable number of analytical data presented.

THE INSTITUTE OF METALS.

There was a record attendance at the Annual May Lecture, held on May 2, to hear the Hon. Sir Charles A. Parsons describe his investigations on "The Formation of Diamond."

The view expressed by Moissan and Crookes that great pressure is the "causa causans" of the crystallisation of carbon as transparent diamond from a matrix of pasty iron, must now be regarded with very grave doubt, for the author has shown by a series of experiments extending over many years that the gases occluded in the iron, and not "bulk" pressure, constitute the determining factor.

In the first series of experiments, carbon and carbon compounds were heated under pressure in an electric furnace by means of a central conducting core, electrically heated. Although upwards of 200 chemical reactions were investigated, the only crystalline carbon formed was graphite, and in the few cases where formation of diamond was noted it was traced to the presence of iron in the charge or from parts of the pole pieces, etc. The next set of experiments was designed to effect the melting of carbon in bulk. To this end a core of graphite was heated alone, and with rods of iron or tungsten embedded in it, in a furnace lined with magnesia (the best refractory). Beyond a slight alteration in the structure of the graphite, no change was observed, not even when the pressure was raised to 15,000 atmospheres. The next method of attack consisted in firing black sporting powder from a duck gun, the barrel of which was fitted with a piston with a travel of 36in., a mixture of acetylene and oxygen filling the barrel in front of the piston. Although the estimated pressure and temperature attained were 15,000 atmosphere and 15,250—17,700° C respectively, there was no evidence of melting or crystallisation of the carbon present. A like negative result was obtained when a steel bullet was fired from a specially constructed rifle into a hole in a steel or tungsten block in the presence of carbon or a carbon compound. The maximum (momentary) pressure obtained in these cases was calculated to be about 5000 tons per sq. in., a pressure about equal to that at the centre of the earth.

Other experiments showed that highly carburised iron does not expand to any great extent on setting, a fact which negatives the view of Moissan that the crystallisation of carbon as diamond from molten iron is due to the expansion of the molten nucleus as it sets (together with the contraction of the outer layers). It was also established that rapid cooling is not a factor in the production of diamond. In the last series of experiments in which iron was heated in a carbon crucible *in vacuo*, it was observed that the metal parted with the occluded gases very slowly and also absorbed them slowly. In no experiment with a vacuum higher than 2 mm. was diamond ever found in the crucible, but it was present in the ejected iron which had not lost its occluded gases. All the observations and the inferences drawn from them point to the conclusion that the formation of diamond in a matrix of iron is determined essentially by the occluded gases, and probably chiefly by carbon monoxide; the temperature and pressure need not be very high.

Regarding the possibility of making diamonds industrially, the lecturer said that this might be achieved by submitting a large mass of iron, alloyed with other elements, to suitable heat treatment, and then after setting, but when still permeable to gas, exposing to carbon monoxide at about 1000 atmospheres for a long time. The lecture concluded with some reflexions upon the origin of natural diamond viewed in the light of the facts above related.

THE IRON AND STEEL INSTITUTE.

The annual meeting of the Iron and Steel Institute, held on May 2 and 3, was attended by an exceptionally large number of members. The new President, Mr. Eugène Schneider, of the famous Creusot Works, received a warm welcome on his induction to the chair, and his address, which dealt in part with the supply of war material in France under the difficulties caused by the invasion, and in part with the relations between science and technical practice, was full of illuminating suggestions.

The number of papers in the programme (21) was so large that each could occupy only a very short time, although four sessions were held, but by a system of grouping papers dealing with cognate subjects, it was found possible to give good opportunities for discussion. Thus the first day was principally devoted to blast-furnace practice and the second to steel problems. The report of the Committee on blast-furnace practice proved to be disappointing, although the questions circulated by the Committee among furnace owners resulted in the collection of a large mass of valuable information. For purposes of discussion, the papers on fuel economy in blast-furnaces by Mr. T. C. Hutchinson, on copper tuyères by Mr. A. K. Reese, and on the importance of coke hardness by Mr. G. D. Cochrane, were grouped together, whilst Mr. K. Chance's paper on the recovery of potash from blast-furnace gas was taken as read. It was evident that some differences of opinion existed in regard to the most suitable dimensions of the bell for ensuring the uniform distribution of the charge in the blast-furnace, whilst attention was also called to the advantages of the use of a glass-fronted model for the purpose of studying that distribution and similar questions. The opinion seemed to be general that both ores and coke had deteriorated in quality in recent years. An exceptionally valuable and authoritative paper on the Jurassic ironstones of the United Kingdom was contributed by Dr. F. H. Hatch, the information having been collected in the course of the work of the Ministry of Munitions. The author recommended breaking the ore to a more uniform size, with elimination of the fines, as a means of improving the blast-furnace burden, and urged a better provision for storage at the furnaces.

The new method of producing sound steel by lateral compression of the top part of the ingot, devised by Mr. B. Talbot, proved to be a great advance on previous work. The ingot mould being provided with a refractory top, the segregation is confined to a short length in the upper part, and it is also possible to strip the ingot when the lower 80 per cent. is perfectly solid, but the upper 20 per cent. is still a shell containing liquid. Compression of this shell by means of four hydraulic rams forces up the liquid contents, and yields a sound mass. Sulphur prints showed that an average of 95 per cent. of sound steel was obtained from the pressed ingots. The paper also contained a most ingenious method for preparing the refractory tops, in place of using fire-bricks or rammed ganister. The ingot mould has an expanded head, into which a suspended iron core is lowered, the annular space then being filled with molten acid open-hearth slag. The core is removed after the slag has solidified, and the lining thus formed withstands a large number of casts. The new device met with very general approval.

Two papers dealt with the subject of inclusions in steel. Dr. A. McCance's paper embodied the results of a very full investigation of the nature of slag inclusions, and represented an application of physical chemistry to a most important practical problem. The chemistry of silicate and sulphide slags is very complex, and the discussion showed that clear views are not always held even as to the

manner in which sulphur is removed from steel by manganese, although the principle is in reality perfectly simple. Dr. McCance's work marks a very distinct advance in our knowledge of slag inclusions. In the course of the subsequent discussion, the question of the relative values of large and small ingots arose, some experienced steel-makers expressing opinions in favour of the latter. Dr. Stead, in the first of his three communications, described experiments to determine whether non-metallic inclusions have or have not the power of causing the segregation of ferrite around them. The conclusion arrived at was in the negative, and although the author was inclined, on second thoughts, to qualify his statement, it received much support. Mr. J. N. Kilby discussed a number of types of defects in steel ingots. Opinions still differ as to the best temperature for pouring, but evidence for the view that steel is best poured hot to avoid defects is accumulating. Dr. Stead's other papers added to his previous work on the relations of iron, phosphorus and carbon, and described the constituents of blast-furnace bears, a source of material which has yielded most interesting results, the slow crystallisation of such large masses enabling the development of many constituents to take place on a far larger scale than in any laboratory operations.

Mr. J. H. Whiteley showed that the divorcing of pearlite, with a consequent increase in the combined carbon shown by the Eggertz colour test, is greatly accelerated when steels are annealed after cold-working. The divorcing of pearlite is also an essential feature in the production of damascened steel, a paper on which was communicated, but not read, by Col. N. Belaieu. A mechanical study of the effects of cold-working on steel was presented by Mr. J. A. Van den Brock, whilst Mr. E. F. Law described experiments on the influence of mass on heat treatment, 18-inch cubes of steel being used, and cooling curves of different parts of the cube being determined in each experiment. Cases of the failure of steel boiler plates caused by the excessive growth of crystal grains in the carbonless ferrite bands were described and explained by Dr. Rosenhain and Mr. D. Hanson. The meetings were well attended throughout, and animated discussions took place.

CORRESPONDENCE.

ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

Sir,—The attention of my Council has been called to a certain misapprehension which exists in the minds of the public as to the body entitled to speak on behalf of the chemical manufacturers of the United Kingdom. In this connexion, I would call attention to a paragraph in the Report of the Committee appointed by the Minister of Reconstruction to advise as to the procedure which should be adopted for dealing with the chemical trade, which reads as follows:—

> "We are, however, of opinion that the "Association of British Chemical Manufac-"turers is the most representative association "of the chemical trade at present in exist "ence in this country, and that it does. "generally speaking, represent the trade as "a whole."

The address of the Association of British Chemical Manufacturers is 166, Piccadilly, W.1.

Thanking you for giving publicity to this letter

I am, etc.,
G. Mount
(*Secretary*).

April 26, 1918.

THE PROFESSION OF CHEMISTRY.

INSTITUTE OF CHEMISTRY.

An extraordinary general meeting of the Institute of Chemistry was held at King's College, London, on April 27, to consider matters submitted by the Executive Committee of the proposed British Association of Chemists, having in view the desirability of effecting the more complete organisation of properly trained and competent chemists.

The following resolutions were passed:—

I. "*That it is desirable that the Council modify the existing requirements of the Institute, in order to include as many chemists as possible in the membership (Associateship and Fellowship) of the Institute, so far as such a course is within the provisions of the Royal Charter of the Institute.*"

II. "*That it is desirable that any candidate who has complied with the following conditions be accepted as eligible to apply for admission to the Associateship of the Institute without examination:*—

That he has attained the age of 21 years; and either

(*a*) That he has obtained a degree with first or second class honours in Chemistry (or other degree or diploma recognised by the Council as equivalent, after a three years' systematic day course, and (i.) has taken a further year's training in chemistry at a recognised University or College; or (ii.) has had two other years' approved experience* under a Fellow of the Institute or in a laboratory or works approved by the Council; or

(*b*) That he has obtained a degree with first or second class honours in Chemistry (or other degree or diploma recognised by the Council as equivalent) after a four years' systematic day course; or

(*c*) That he has obtained a degree with first or second class honours in chemistry after training (by day or evening classes) and experience equivalent in extent and character, in the opinion of the Council, to the training and experience specified in the two preceding paragraphs;

Provided in every case that the candidate has produced satisfactory evidence of training and examination in physics, mathematics and an optional subject."

III. "*That, until December 31, 1921, it is desirable that any candidate who can produce evidence satisfactory to the Council of having had a sufficient general and scientific education, and of having practised pure and applied chemistry for not less than seven years, and who holds a responsible position, should be accepted as eligible to apply for admission to the Associateship of the Institute, without examination, provided that he has complied with the provisions of the Charter of the Institute with regard to age, general education and scientific training—in chemistry, physics, mathematics, and an optional subject—and that he has passed approved examinations in those subjects.*"

> Note.—In considering applications under this clause, the Council will expect candidates to produce evidence of having been trained and occupied in a manner which, in the opinion of the Council, is equivalent to fulfilling the condition required of candidates admitted under II. (*a*).

IV. "*That candidates who have not complied with the conditions specified under II. or III. immediately above, or with the regulations adopted as a temporary*

* One year may be accepted by the Council as sufficient where the approved experience in a laboratory or works has been acquired *subsequently* to the prescribed training in a recognised University College.

(War) measure, be required to comply with the Regulations adopted and published by the Council in July, 1917."

V. "*That it is desirable that the list of Institutions recognised by the Council for the training of chemists should be reconsidered with a view to its further extension.*"

VI. "*That it is desirable that local sections of the Institute be formed in important centres where a membership of not less than forty can be assured, the main objects of such sections to be to maintain the interest of the members in the general welfare of their profession and to promote social intercourse.*"

VII. "*That it is desirable that steps be taken to revise the present system for the election of the Council in order to give the general body of members greater freedom of nomination and election, with a view to securing representation from different localities and from different branches of the profession.*"

The Council will now proceed to modify the constitution and Regulations of the Institute on the lines indicated.

With regard to elections to the Fellowship, and elections to the Associateship under the temporary (War) conditions, the Council will review its policy from year to year, immediately after the annual general meeting.

It is the intention of the Council to maintain the requirements for Fellowship at a decidedly high level. Every Associate will be required to produce evidence that since his admission and for a period of three years therefrom, he has been continuously engaged in the study and practice of chemistry in a manner satisfactory to the Council; and that he has carried out original research of sufficient merit in the opinion of the Council, or that he has devised processes or inventions of sufficient merit in the opinion of the Council, or in special circumstances, that he is possessed of knowledge and ability equivalent, in the opinion of the Council, to having fulfilled the conditions specified above; otherwise an examination will be imposed.

Provisional Local Sections are in course of formation at the following centres: Edinburgh, Glasgow, Gretna, Liverpool, Manchester, North-East Coast and Yorkshire, and rules for such Sections have already been drafted.

Committees will also be formed when necessary to represent the interests of special branches of the profession; the provisions for the registration of students will be reconsidered; steps will be taken towards closer co-operation between the work of the Institute and that of the Universities and Colleges; the question of extending the publications of the Institute will be reviewed; further endeavours will be made to bring before the public the importance of chemistry to the country; and generally to forward the interests of chemists in every way possible.

LIGHTING, HEATING AND POWER ORDER, 1918.

In reply to a letter addressed to the Board of Trade the Registrar of the Institute of Chemistry has received the following answer:—

25th April, 1918.

SIR,—With reference to your letter of the 5th April, on the subject of the restriction on the consumption of gas and electricity imposed by the Lighting, Heating and Power Order, 1918, I am directed by the Board of Trade to state that where consulting analytical research and technological chemists and teachers and professors of chemistry are able to show that by reason of their professional needs, they have been unable to effect the economy prescribed by the Order the Board will accept this as a sufficient explanation under paragraph 14 of the Order a copy of which is enclosed.—I am, Sir, etc., (*Signed*) HERBERT C. HONEY.

NEWS AND NOTES.

AUSTRALIA.

Mr. Hughes announced, on April 26, that a contract has been arranged whereby the British Government purchases practically the whole of Australia's output of zinc concentrates for the period of the war and for ten years thereafter. This is probably the largest sale of zinc ever made. Great Britain takes the stocks on hand in December, less a definite percentage reserved, and thereafter 250,000 tons annually during the war and one year after, and 300,000 tons annually during the nine following years. Provision has been made for supplying adequately the requirements of Australian zinc refining works and also for fulfilling existing contracts with Japan. Mr. Hughes regards the contract as most satisfactory to all who are concerned in seeing the control of this metal secured by the Empire.

* * *

H.M. Trade Commissioner in Melbourne reports that the State Ministry of Victoria has decided to investigate the possibility of utilising water powers for the supply of electrical energy before undertaking the development of the brown coal deposits for the same purpose.

According to a press report, steel plates have been produced for the first time in Australia by the Broken Hill Co.'s steel works at Newcastle. When further modifications in the equipment have been effected it is anticipated that Australia will be independent of external sources of supply of rolled plates for her shipbuilding industry. A continuous rod mill has arrived from the United States, and is being erected for the supply of wire rods for fencing and other purposes.

Under the provisions of the Artificial Fertilisers Act, 1915, of Victoria, all manufacturers and importers of fertilisers containing nitrogen or phosphoric acid must submit a brand for, and full particulars of, each fertiliser they intend offering for sale. A list of the fertilisers registered for 1918 may be consulted at the Board of Trade (Dept. of Overseas Trade).

The Committee of the Advisory Council of Science and Industry appointed to inquire into the production of alcohol for power purposes has issued its report. The most suitable raw material for producing such alcohol is the sugar molasses now wasted in Queensland; but only about 3½ million gallons would be obtainable annually from this source. Sorghum (sweet) stalks, cassava and sorghum grain might be cultivated profitably as sources of alcohol. The Committee recommends that "power-alcohol" should be denatured with 2 per cent. of ether, or with those fractions of coal tar oil distillates which are obtained at 170—230° C., or with cresote oil; that alcohol manufactured from Australian materials be granted a rebate of 3d. per gallon; and that such alcohol should be granted a bonus of 3d. per gallon.—(*Bd. of Trade J., April* 18, 1918.)

CANADA.

It is announced that authority has been granted under the Saskatchewan Companies Act for the organisation and operation of a Company with a capitalisation of £200,000 for the purpose of manufacturing binder twine, commercial twine and general cordage from flax straw in Saskatchewan under the new process by which it is estimated that from a ton of flax straw 270 lb. of twine can be manufactured. A large local and export trade is anticipated.

The mineral production of the Province of Quebec for the year amounted to a value of $13,287,024, which is the highest ever recorded, being an increase of nearly $200,000 over the previous best year. This satisfactory result is wholly attributable to the products of the mines proper, such as asbestos, copper, chromite, magnesite, molybdenite, zinc and lead. There has been a shortage of labour in the mines of the province which has led to a very notable increase in wages.

SOUTH AFRICA.

Alcohol motor fuel, termed "Natalite," and methylated spirit are now being manufactured at Merebank, Natal, by the fermentation of treacle from the sugar estates. The residue left after distillation, known as "dunder," is used as a fertiliser.—(This J., 1918, 95 R.)

In the course of an address to the members of the Agricultural Congress at Capetown, during discussion on a motion urging the adoption by the Government of a vigorous industrial development policy, Mr. Warington Smythe, Secretary for Mines and Industries, said that remarkable progress had been made in the tin industry, and the wants of the Union are now being met without having to depend on overseas sources. Another industry which was being developed considerably was asbestos, of which enormous deposits had been discovered. Certain difficulties have now been overcome, and South African asbestos is admitted by users in Europe to be of a very good quality. A product of growing importance was coke, many ovens having already been established in Natal. The coke was as good as the coke used in Europe. Until last year no arsenic was being produced commercially. Sulphur (from iron pyrites) also held out promise, but much spade work would be necessary before the production could be on a large scale. Immense quantities of limestone existed in the country, and these would be particularly valuable for agricultural purposes. Surveys and analyses were now being made. In regard to the iron industry he said that there was now an electrical furnace in Johannesburg, which was paying its way. Immense strides had been made in developing ores, very valuable deposits had been discovered, and the future was encouraging. Furnaces had been erected at Pretoria and Vereeniging chiefly for dealing with lower grade ores. With reference to the serious position of fertilisers, Mr. Smythe said that experiments were being made with rock phosphates, but the results were not as yet wholly satisfactory. Endeavours were being made to secure freight to bring superphosphates to the country. Other investigations were being made, and he pinned much hope on the use of waste products from abattoirs.

UNITED STATES.

Recovery of Oil from Oil Sands.—In view of the rapidly increasing demand for petroleum and its products, the U.S. Bureau of Mines has issued a bulletin in which various methods are considered and described for getting a greater yield from the wells. It is the general opinion that not over 50 per cent. of the oil is obtained from an oil field when it is abandoned. In this publication (Bulletin 148, Methods for Increasing the Recovery from Oil Sands, by J. O. Lewis) the following methods are described: Use of gas or vacuum pumps, forcing compressed air or gas through the oil-bearing formations, displacing the oil by water, and the better use of the natural pressures in the oil-bearing formations. The Smith-Dunn process for forcing compressed air through oil-bearing formations is believed to be the most promising method.

Water Power Development.—The development of water powers on the public lands and the streams of the United States has always been a complex subject, owing to the various departments, bureaus and authorities under which they are administered. If the waterfalls are within public lands they are under the jurisdiction of the Secretary of the Interior; if within the forest reserves the Secretary of Agriculture is the authority, whereas if they are on navigable streams it is the Secretary of War who controls. The term navigable streams is more comprehensive than it sounds. It means not only what it says but also all streams which in the opinion of the Secretary of War may be made navigable by engineering operations. The tenure of leases was open to question and there remained with the Government powers of recapture which involved all sorts of complexities which have prevented many developments that should have been undertaken before the war. A Bill now before Congress will remedy these defects in large measure, and is likely to lead to the development and welfare of electro-chemistry.

The Chemical Alliance.—The Council of National Defence was disbanded because a law enacted by Congress made it a misdemeanour for a person acting in an official advisory capacity to the Government to counsel the purchase of wares from any organisation in which he is interested. The Committee on Chemistry included the leading manufacturers of the country; therefore no other course was open. In order to continue the work that was begun, however, the members of the Committee and as many other manufacturers of chemical products as they could induce to join them, organised the Chemical Alliance which has its headquarters in Washington. The Alliance already includes representatives of most of the leading chemical industries, while its main function is to devise means of meeting sudden demands for materials for war purposes: it is also assisting by placing its information at the disposal of the Government.

GENERAL.

British Scientific Products Exhibition.—With the assent of the Ministry of Munitions and the approval of the Board of Trade, the British Science Guild is organising an exhibition of scientific products and apparatus, to be held at King's College, London, during August next. The exhibition has been planned with the twofold object of bringing home to the public the imperative necessity of sei ntific research and of its application to the arts and industries, and of illustrating the progress that has been made in this country in the production of materials and appliances which were formerly obtained chiefly from abroad.

The exhibits will be classified under some eleven headings. The section devoted to chemistry will include, *inter alia*, synthetic dyes, pigments, and other organic products; pharmaceutical, medicinal and food preparations; chemicals used in agriculture, leather industries, etc.; pure chemicals used in research, and compounds of the rare earths; tungsten minerals and products, and ferro-alloys generally.

The other sections will contain exhibits relating to: Thermal appliances, electrical appliances, optical apparatus, glass, quartz, refractories and porcelain, photographic apparatus and materials, measuring instruments, surgical and medical appliances, paper, textile specialities, and exploitation of British natural products. The exhibits will be explained by competent attendants, and short lectures and addresses will also be arranged. The Guild has already obtained the promised help of some leading manu-

facturers, and it is hoped that all scientific men will rally to its support. The chairman of the Exhibition Committee is Prof. R. A. Gregory, and the organising secretary, Mr. F. S. Spiers, 82, Victoria Street, S.W. 1.

U.K. Output of Coal in 1917.—According to a Home Office Report the output of coal from mines in the United Kingdom under the Coal Mines Act in 1917 amounted to 248,473,119 tons as compared with 256,348,351 tons in 1916, a decrease of 7,875,232 tons. The output for the years 1913—14—15 amounted to 287,411,869 tons, 265,643,030 tons, and 253,179,446 tons respectively. The number of persons employed during 1917 at mines under the Coal Mines Act was 1,021,340, a decrease of 106,550 persons on the pre-war year of 1913, but an increase of 23,277 persons on the figures for 1916.

The above figures are subject to revision.

Indian Crop Forecasts, 1917-18.—The total yield of raw sugar from 99 per cent. of the area under sugar-cane is estimated finally at 3.229,000 tons, or 18 per cent. more than obtained in the previous year. The area under cultivation shows an increase of 16 per cent. The season was generally favourable, and the condition of the crop good.

In the Provinces of Madras, Bombay and Burma, where 99 per cent. of the ground nut area is situated, the total yield of nuts in shell is predicted to be 1,042,000 tons from 1,894,000 acres, as compared with 1,961,000 tons from 2,334,000 acres obtained in 1916—17. Climatic conditions have been unfavourable. The decreased area under crop and the fall in prices are mainly due to shortage of tonnage for export.

The areas under rape and mustard, and under linseed, were forecasted in March to be 3,942,000 and 2,932,000 acres respectively, the former showing a decrease of 51,000 and the latter a gain of 230,000 acres. The outlook for these crops is reported as "fair to good."—(*Dept. of Statistics, India.*)

American Petroleum Industry.—The United States Census Bureau has recently issued the statistics of the petroleum refining industry up to 1914. The figures show a steady advance for the previous 35 years, the value of the output in 1914 being nine times as great as in 1879. New Jersey, California, and Pennsylvania produce over one-half of the total output.

Owing to the growing demand for gasoline (petrol), the lighter products have of late years formed an ever-increasing proportion of the total output, as is shown by the following comparison :—

	1904.	1914.
Gasoline and light naphthas	11·5	18·6
Fuel oil	14·2	47·5
Illuminating oils	12·4	24·6
Tar	6·3	1·7
Greases	0·4	0·2
Waxes	1·6	0·7

The total production of gasoline for 1914 was 24,700,000 barrels (of 50 gallons), of which 800,000 barrels were obtained from processes in which natural gas was liquefied.

The tendency of the industry to become concentrated in large establishments is shown by the fact that the number of factories turning out over 1,000,000 dollars worth of products increased from 35 in 1909 to 54 in 1914. Of factories 10 times this size there were 5 in 1909, and 12 in 1914.

It is estimated that the industry employed over 31,000 persons in 1914, and that the total value of the output reached nearly 400,000,000 dollars.—(*U.S. Com. Rep., Feb.* 18, 1918.)

Mineral Discoveries reported in Germany.—Big anthracite deposits have been discovered in New Braunschweig.

Tantalite, containing 82·23 per cent. of oxide and 3·57 per cent. of niobium, has been found in German (?) S.W. Africa.

New molybdenum deposits have been discovered in Peru, in the provinces of Jauga, Huancayo and Contumaza. An export tax of 20 marks per ton has been imposed.—(*Chem. Zeit., Feb.* 2, 1918.)

In the communal stone quarry of Ober-Rosbach (Taunus) numerous veins of blue quartzite containing platinum have been discovered. Experiments have proved that the quantities are sufficient to repay exploitation. Large funds are already forthcoming for the purpose.—(*Hamburgischer Correspondent.*) [*Bd. of Trade J., April* 25, 1918.]

Production of Beet Sugar in Europe.—The following table gives the estimated production of raw sugar in various countries of Europe :—

	1917-18.	1916-17.	1915-16.	1914-15.
1000				
Germany ...... tons	1600	1550	1512	2600
Austria-Hungary ,,	670	944	939	1602
France .... ,,	225	207	150	336
Russia .... ,,	1100	1325	1671	1977
Belgium ...... ,,	130	135	113	204
Holland ...... ,,	250	269	243	302
Sweden........ ,,	133	118	127	154
Denmark .... ,,	115	113	125	153
Other countries ,,	200	250	300	367
Europe .... ,	4423	4911	5180	7695

—(*Z. angew. Chem., Feb.* 2, 1918.)

Italian Lignite Production.—To meet fuel demands, the lignite deposits of Italy have recently been worked to a much greater extent than previously. This is shown by the following yearly figures: 1913, 697,000 tons; 1914, 778,000 tons; 1915, 939,000 tons; 1916, 1,268,000 tons; 1917, 1,500,000 tons.

Seventy-two per cent. of the entire Italian production comes from Tuscany, and the bulk of this is produced in the Valdagno district. Umbria is the next important centre, with a production of 13 per cent. of the national output. This district is of importance as it serves the steel works of Terni, now busily engaged on munitions. Sardinia accounts for 6 per cent. of the total output and has increased its production very greatly; the output for 1917 was about 60,000 tons, as compared with 22,000 tons in 1915.

Bergamo, which produces 4 per cent. of the whole, had an output of 55,000 tons in 1917, as compared with 24,500 tons in 1916. While these last two instances show the greatest progress and best organisation, the lignite position is still dominated by the Tuscan district, in particular by the Valdagno mines.—(*U.S. Com. Rep., Feb.* 11, 1918.)

Sulphuric Acid in Switzerland.—Before the war Switzerland imported some 12,000 tons of sulphuric acid, and 8000 tons of hydrochloric acid yearly, through the firm of Heinrich Schnorf in Utikon. Another large factory is now being built in Basel for use after the war.—(*Chem. Zeit., Feb.* 20, 1918.)

Coal in Algeria.—Owing to the scarcity of coal and other combustibles, impetus has been given to the working of a coalfield situated in Colomb-Bechard, in the south-west of Algeria, bordering on Morocco. The deposit appears to be over 8000 feet in length and 18 inches thick, and it is estimated that 10,000 tons of coal of fair quality can be extracted by surface working. A test on a local railroad, using 2 tons of the coal to 660 lb. of briquettes, prove quite satisfactory. Deposits of lignite are also being worked.—(*U.S. Com. Rep., Mar.* 26, 1918.)

German Coal Industry during the War.—Statistics for the output of the German coal mines are only

available for the first two years of the war, the German censor having stopped their publication from 1916. These show considerable decreases in the case of coal (about 45 million tons) and coke (nearly 6 million tons) between the years 1913 and 1915, but increases in the output of lignite (1¼ million tons) and briquettes (2½ million tons). The falling off was mainly due to the calling up for military service of a large proportion of the miners, and to transport difficulties caused by military demands. The German Government made an attempt to remedy matters by sending more labour to the mines, but this consisted only of unskilled workers. Nevertheless the rate of output was increased to almost the normal in 1916. The shortage of skilled miners was lessened by the introduction in 1917 of deportees from the Belgian mining districts.

To increase the absolutely necessary supply of by-products of coal carbonisation, the Government issued an appeal to the cokeries, and did all in its power to push the sale of coke. The consignments of coke by the Rhenish-Westphalian syndicate increased from 15 million tons in the whole of 1914 to 6 million tons in the first quarter of 1916.

Increases in general working expenses, wages, Government taxes and local rates resulted in a large advance in sale prices. According to the calculation of a German paper, the price of anthracite rose 93·5 per cent. between 1914 and 1917, of coke 72 per cent. and of briquettes 48·7 per cent. The following prices per ton were quoted on March 31, 1917:—Gas coal, 16s. 9d., anthracite 27s., blast furnace coke 22s., and the first quality of briquettes 20s. 6d.

Commencing on Aug. 1, 1917, a duty of 20 per cent. was levied on all coke, coal and briquettes, whether from German pits or imported. This levy is to remain in force for three years.

After passing through a grave crisis, the Rhenish-Westphalian Coal Syndicate was renewed at the end of 1916. With the co-operation of all the mines in the Ruhr district and of the Prussian fiscus, this now monopolises the mining and sale of fuel in almost the whole of the Empire.

News of a very serious coal shortage in Germany in the last three months of 1916 and during the first half of 1917, leaked past the German censor. Many blast furnaces had to be shut down, and even munition works could not be kept going. The trouble was due to a shortage in rolling stock and to reduced railway staffs, and resulted in a sudden rise in fuel prices. The Government thereupon took steps to save fuel on one hand and to facilitate the distribution of supplies on the other. Stringent regulations were issued enforcing early closing and diminished lighting and curtailing railway and tramway services. Instead of improving, matters became worse during the winter of 1916-1917. Water carriage had helped distribution to a slight extent, but the canals were ice-blocked during the first three months of 1917. The total production was decreased by dissaffection and strikes amongst the miners, caused, according to the German press, by shortage of food. Large numbers of miners were now released from the army, and labour was transferred even from safety work, such as timbering. Last July the German Coal Controller was able to announce that the measures taken had been so successful that the output of coal in the previous May had reached 13,900,000 tons (as against 16,000,000 tons in May, 1914), and that of lignite 7,900,000 tons (as against 7,400,000 tons in April, 1914).

Industrial establishments have been recommended to burn as much as possible of lower grades of fuel, such as coal and coke dust, and to sift their ashes. Greater attention has also been paid to the utilisation of peat as a fuel.—(*Iron and Coal Tr. Rev., April* 12, 1918.).

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

British Aluminium Company (Lochaber Water Power) Bill.

In moving the Second Reading of this Bill (this J., 1918, 35 and 115 R) on April 30, Viscount Chilston urged the necessity of increasing the production of aluminium as it was a "key" or pivotal industry and of great importance in modern warfare. The proposed new works would, moreover, give employment to many thousand workers, including demobilised soldiers. The Bill had received the support of the Government, and especially of the Board of Trade, the Ministry of Munitions and the Ministry of Reconstruction.

The motion was opposed by Lords Balfour of Burleigh, Crewe and Lansdowne, and the Earl of Kintore, on the grounds of: local opposition—æsthetic, and the diversion of water power from one district to another; inadvisability of giving exclusive rights to a private company; and the promotion of a contentious measure during the war. A "key" industry should be kept in public hands; the works in questions would cost at least 1½ millions, and owing to the deficiency of labour, they could not possibly be taken in hand before the end of the war.

In deference to the very strong opposition, Viscount Chilston withdrew the motion.

HOUSE OF COMMONS.

Treatment of "Gassed" Soldiers.

Sir George Greenwood asked the Under-Secretary for War whether his attention has now been called to the treatment of cases of gassing by inhalations of ozone generated from atmospheric air as distinct from the treatment by the use of pure oxygen, and as employed by Major George Stoker, R.A.M.C., and described by him; whether he is aware that this treatment has produced excellent results; and whether he will take steps in order that it may be extensively used.

Mr. Macpherson: This method of treatment has been under trial for some time, but the results so far have not been such as to justify its general adoption. It is still under trial, and if the results indicate the advisability of doing so, its use will be adopted, but up to date its efficiency is not proved.—(April 22.)

Spirit Duty (Medicinal Preparations).

Mr. Baldwin (Joint Financial Secretary to the Treasury), referring to a question raised by Mr. Glyn-Jones concerning the effect on the price of medicinal compounds of the proposed increment of 15s. 3d. per gallon in the spirit duty, said: "The Government will arrange to give an abatement at least equal to the tax in those cases. We have not yet decided on the exact way in which it shall be done, but it has been considered, and has been considered favourably."—(April 23.)

Iron and Steel Exports to France.

Mr. Lough asked the President of the Board of Trade whether his Department has agreed with the French Government that all exports of iron and steel from this country to France be entrusted to the Comité des Forges; whether he will take steps to prevent the collection of information which would allow this Comité, after the war, to control all such exports to the possible exclusion of British merchant firms; whether the Comité has been granted a monopoly to buy British tinplates for French consumers; and whether he is aware that the Comité des Forges is a private association of French iron mine owners and of iron and steel producers.

Mr. Wardle replied that, owing to the shortage of steel and tinplates in this country, only limited supplies are available for France, and

the French Government was invited to set up machinery for deciding how the limited supplies could be best allocated. All exports of these goods from the United Kingdom are consigned to the body appointed by the French Government to act as a distributing channel between the producers here and the consumers in France. The French Government has selected the body referred to in the question for this purpose. Whilst it is recognised that this arrangement has certain inevitable drawbacks, the President of the Board of Trade is not prepared in the circumstances to interfere with it.—(April 24.)

Coprolites.

In answer to General Croft, Sir Worthington Evans, representing the Ministry of Munitions, said that the initial expenditure on plant, wages, buildings and railways for the development of the new coprolite works was £31,279. The value of coprolites produced to date is negligible, but deliveries are anticipated to commence at the end of the present month at a rate which will, it is hoped, shortly rise to 1200 tons per week, and that a total production of some 80,000 tons, of a value of, approximately, £280,000 will be secured.—(April 25.)

Methyl Alcohol.

Sir W. Pearce asked the Chancellor of the Exchequer (1) if he will grant the free use of pure methyl alcohol, undenatured, for industrial purposes for which it is shown to be essential, to the satisfaction of the Board of Customs and Excise, and under similar conditions for which permission is at present granted for the use of industrial spirit; and (2) if he is aware of the importance of pure methyl alcohol, undenatured, in chemical industry and of the present difficulties which hinder the development of manufactures requiring its use; and if he proposes to take any action in the matter.

Mr. Bonar Law: The Board of Customs and Excise is aware of the importance of pure methyl alcohol undenatured in chemical industry, and has already decided to allow its use for certain purposes, *e.g.*, in the manufacture of fine chemicals subject to certain conditions, but it would reserve the right to require the spirit to be denatured when the circumstances seemed to justify that course. The conditions to be imposed would be on the lines of those governing the use of industrial methylated spirits.—(April 29.) (See this J., 1918, 31 R, 26 T.)

The Haber Process.

In answer to a series of questions put by Sir W. Beale concerning the patents protecting the Haber process, and the efforts made in this country to work it, the Parliamentary Secretary to the Ministry of Munitions (Mr. Kellaway) said that the process was protected by British patents, which, as in the case of other patents communicated by German firms, are vague as to the fundamental factors necessary for the successful commercial operation of the process. The exact knowledge existing in this country was entirely insufficient to justify commencing the erection of a manufacturing plant without extensive research. Modifications of the patents have been made and protected by Departmental patents in the names of the Research Staff or the Controller of Munitions Inventions, and assigned to the Secretary of State for War. The process and modifications so protected have not yet been used by British manufacturers for actual production as distinguished from laboratory investigations, since the research work, which has been conducted unremittently since July, 1916, has only within the last month or two reached a stage at which it was considered possible to proceed from the laboratory scale to the manufacturing scale.

In view of the importance attached to the modifications made in the process and to the probable utility to the enemy of information upon these modifications, the results of the research work have not b en made public, since such information is only of value to those desiring to erect a large Haber plant. This information could be communicated confidentially if proposals for the erection of a plant were put forward, and the financial arrangements approved by the Treasury.

Use is being made of the knowledge for war purposes as is indicated by the fact that the Explosives Department is now engaged in translating the research work into large-scale operations.

Conferences are being held between the Ministry, the War Office, the Admiralty, the Board of Trade, and other Departments with a view to determining how far and in what manner the results of the general research work of the Munitions Inventions Department can be placed at the disposal of the manufacturers of this country for the benefit of the nation as a whole. In the meanwhile all information possible will be given.

The fundamental factors of the Haber process and the details essential for its successful commercial operation have never been known outside Germany, and the erection of definite works in this country was, therefore, impossible until these factors and improvements had been thoroughly established.

With regard to other processes for the fixing of nitrogen, of which details are known, various proposals have been submitted by manufacturers and have been considered in detail by the Nitrogen Products Committee of the Munitions Inventions Department. These schemes were either withdrawn by those who put them forward tentatively or were found to be unsound from the point of view of having to face foreign competition after the war. In the case of the cyanamide scheme, recommended by the Committee itself, the plant required was of a nature that it could not be supplied within reasonable time without crippling important war services.

The whole complex problem of nitrogen fixation in its relation to the needs of this country and to parts of the Empire has been investigated in great detail during the last two years by the abovementioned Committee, and the Final Report of the Committee is now in course of preparation.—(May 2.)

Saccharin.

In reply to a question of Sir C. Henry's, Mr. Clynes said that the progress which is being made with the manufacture of saccharin in this country is as satisfactory as can be expected, having regard to the technical difficulties surrounding a new manufacture of this character. The prices of tablets made from British-made saccharin have been fixed by arrangement with the trade, and it is hoped that in the near future it will be possible entirely to dispense with the supplies of higher-priced imported saccharin.—(May 2.)

Patents and Designs Bill.

Mr. Perkins asked the President of the Board of Trade whether it is his intention to re-introduce the Patents and Designs Bill, 1917, during the current Session; and whether it will provide for an extension of the life of patents the working of which has been prevented during the war. Sir A. Stanley replied that notice of motion to introduce the Bill has already been given. The Bill will contain clauses dealing with the matter referred to in the second part of the question.—(May 2.)

LEGAL INTELLIGENCE.

Caustic Soda Contract. *S. H. Azancot* v. *Collins and Partners. Collins and Partners* v. *Hancock, Wright and Co.*

In the Commercial Court of the King's Bench Division on April 24 and 25, before Mr. Justice Bailhache, an action was heard in which Mr. Azancot, of Hampstead, sued Collins and Partners of Cardiff, to recover damages for an alleged breach by the defendants of a contract to sell to the plaintiff in September, 1917, 42 tons 6 cwt. of caustic soda.

The case pleaded by the plaintiff was that, by the contract, the defendants agreed to sell to him good merchantable soda of 60—62 per cent. strength, at £37 per ton. Delivery was to be on rail Manchester, to be forwarded to Liverpool, less an allowance of £1 per ton for the repair of damaged drums, net cash against delivery order. On September 12, 1917, the plaintiff through his bankers paid £1522 16s. 0d., and he alleged that the soda delivered was not according to contract, and claimed damages accordingly.

Mr. Wright, K.C., for the plaintiff, said that the sale was by description. After the contract was entered into there was some delay before the arrival of the delivery order. On inspecting in the warehouse, the plaintiff found that the drums were in such a bad condition as to be almost unmarketable. He had bought for shipment to Italy and had an export licence. He claimed to reject, issued his writ, and then discovered that, in addition to this cause of rejection, the quality was not according to the guarantee of causticity; instead of the 60—62 per cent. it was only 30—40. He claimed to reject, he asked for the return of the money paid, and for damages based on the rise in price which took place. The defendants had bought the goods from Hancock, Wright and Co., of Battersea.

Mr. Inskip, K.C., for the defendants, said the warranty was admitted, but contended that the plaintiff was too late to reject, but if there had been a breach he was entitled to recover his damages. There was an action in turn by the defendants against their sellers, Hancock, Wright and Co., of Battersea, arising out of the same transaction.

Mr. Buckley, a witness for the plaintiff, said he inspected the drums and found them in a bad state; the caustic was oozing out from the ends, and much of it had been converted into carbonate of soda. Witness also said that the soda was not of the warranted quality. There was 33·48 per cent. of alkali instead of 60.

Mr. Justice Bailhache, in delivering judgment, said he thought that, on the whole, the plaintiffs' rejection of the drums was not a good one, as it was not absolute and unconditional. The rejection was based on the ground that they were badly damaged beyond the possibility of repair, but he (the Judge) thought their condition had been considerably exaggerated. They were difficult to repair because this was very disagreeable stuff to handle, and if a man chose to buy goods which are said to be in damaged drums he was running whatever risks attached to a contract of that sort. It seemed to him that the difference as between the contract description and the goods delivered, was rather in kind than in degree. The plaintiff was entitled to damages as the stuff sold had only about 30 per cent. caustic soda instead of 60 to 62 per cent., and it could not properly be sold as caustic soda at all, nor could it be used for the required purposes. The defendants, Collins and Partners, were not aware of the nature of the stuff as they never saw it, and they bought on the same description as they sold. They did not know the character of the stuff, but it was a shockingly bad delivery, and the plaintiff was fully entitled to recover the difference between the value of this stuff, as it ought to have been delivered about the end of September, 1917, and the value of the stuff which had in fact been delivered to him. He held the plaintiff was entitled to an allowance of £1250. The second case was similar and was by Collins and Partners against their sellers, Hancock, Wright and Co. The price of the contract here was £1 per ton lower. The defendants were entitled to have the same damages as he had awarded to the plaintiffs. He gave judgment accordingly for the plaintiffs for £1250 and costs, and in the second action for a declaration that Collins and Partners were entitled to be indemnified by Hancock, Wright and Co. in a similar respect.

Sulphuric Acid Plant. *Dillon Vitriol Co., Ltd.,* v. *J. F. Carmichael and Co.*

On April 25, in the King's Bench Divisional Court, Justices Salter and Roche heard an appeal by the Ditton Vitriol Co., Ltd., Widnes, Lancs., against the judgment of Sir W. A. Tilden, the special referee in the action they brought against Messrs. J. F. Carmichael and Co., chemical engineers, Liverpool.

Mr Green, K.C., for the appellants, said the action was referred by Mr. Justice McCardie to a special referee. The plaintiffs in that action claimed damages in respect of defendants' alleged breach of contract in failing to supply a complete sulphuric acid plant within the time mentioned in the contract, and because the plant defendants did ultimately supply would not do the work stipulated. The defence was that the plant was supplied within reasonable time, having regard to the circumstances, and the plant was in fact equal to that contracted for. The referee found that the plant was supplied within a reasonable time having regard to all the circumstances, and that it was substantially in accordance with the contract, though in some small particulars it was not. The referee failed to give plaintiffs damages which they thought they were entitled to. He asked the Court to say that the referee was wrong in his findings of fact, and that the apparatus was not fit to do the work which was contracted for. The original tender was for £10,500 for the erection at Widnes of plant to produce 10 tons of sulphuric acid of 143° Tw. every 24 hours. In view, however, of the rapid increase in the price of lead, of which the plant would contain over 100 tons, the tender was got out on a quotation of £25 a ton. Mr. Furness accepted that tender on behalf of the plaintiff company. The cost of the plant was increased to £10,778 15s. Plaintiffs left it to Messrs. Carmichael and Co. to produce their own plant as they were experts; the only stipulation was that the plant must produce 18 tons of 142° Tw. per 24 hours. Defendants had to do the work by sub-contractors, several of whom did not keep their contracts. It was for defendants, not for plaintiffs, to claim damages from the sub-contractors. There was about three months' delay, and during that time as much as 1620 tons of sulphuric acid could have been made at a profit of £2 per ton. He contended that defendants had contracted to equip, supply and erect a complete sulphuric acid works at Widnes, with a plant of the capacity mentioned, and which he held was to be set up and worked for three or four weeks by Messrs. Carmichael. The latter set up a plant, Mr. Carmichael's partner, a Belgian named M. Guillaume, supervising. It was tested for 3—4 weeks, but did not produce either the quantity or the quality of the acid specified. It was run subsequently for about five months with the same result.

Respondents were not called upon by their Lordships to reply. Mr. Justice Salter, in giving judgment, said in his opinion the application could not succeed. It was common ground that

the works must be supplied, erected and equipped and set to work within a reasonable time. The first question for the referee was whether a reasonable time had been exceeded. The second, and no doubt the main complaint of the plaintiffs was, that the works were not of the agreed capacity and efficiency. The special referee, himself an expert, heard counsel on both sides, the parties, and witnesses, both expert and non-expert, examined the works and had all he thought necessary to decide these questions of fact. His Lordship could not see that the referee had in any way misapplied the law in dealing with the first question. Then the referee came to the conclusion that the reason why these works did not produce the results stipulated for was due to two causes operating both with the plant in the hands of the defendants and in the hands of the plaintiffs. The first cause was inferior material. The second was insufficient skilled labour and direction. His Lordship was certainly not prepared to differ from the referee's finding of fact as to that. The referee also found that the capacity of the furnace was sufficient. He had, therefore, decided both these questions of fact in favour of defendants. The defendants were bound to supply and erect works of the required capacity. Having done that it was not necessary to set it to work, and they were not bound to demonstrate its capacity. His Lordship thought that on no point did the special referee misread the contract, or misapprehend the legal position of the parties. The appeal must, therefore, be dismissed with costs.

Mr. Justice Roche agreed.

A Substitute for Petrol. *A. Pappenheimer* v. *C. W. Donkin and T. W. Paterson.*

Before Mr. Justice Bailhache in the King's Bench Division on April 26, an action was heard in which Mr. A. Pappenheimer (trading as Max Emanuel and Co.), of Hampstead, sued Mr. C. Wyndham Donkin and Mr. T. W. Paterson, both of Liverpool, to recover damages for an alleged breach by the defendants of a contract of August 17, 1916, for the sale of a secret recipe for the making of a substitute for petrol.

The case for the plaintiff was that by an agreement the defendants, in consideration of the plaintiff paying £500 and a royalty, agreed to hand to the plaintiff a secret formula for the manufacture of the material called "Petron." It was represented that the materials for the Petron consisted of by-products readily obtainable in any quantity, that the cost of manufacture was not more than 1s. 3d. to 1s. 4d. per gallon, that Petron was not affected by the petrol licence regulations, that the flash point was not less than 85.°F, and that the Petron could be used with any kind of modern carburettors for commercial or light engines. The plaintiff paid the £500, and it was now alleged that the various representations made were incorrect, and that the Petron manufactured from the formula flashed under 85 °F., and would not give results equal in mileage per gallon to petrol.

The defendants denied making incorrect representations, and they entered a counterclaim for a balance of account for material supplied.

A large number of witnesses were called on both sides to speak to the results of tests that were made with the substance.

Mr. C. W. Donkin deposed that all the stuff sold by him had been prepared according to the formula, and it had given the most satisfactory results to his customers. They had made less since an order was issued putting fuel substitutes on the same basis as petrol. Mr. Paterson also gave evidence as to tests with the substitute.

Mr. Justice Bailhache held that there had been a total failure of consideration for the £500 paid by the plaintiff, and judgment was given for him for £500 and costs on the claim. No judgment was entered on the counterclaim, as the plaintiff agreed to return to the defendants the material in his possession.

GOVERNMENT ORDERS AND NOTICES.

GAS WORKS RETORT CARBON, ETC., CONTROL ORDER, 1918.

The Minister of Munitions has issued an Order, dated April 19, 1918, to the effect that: No person shall until further notice use, purchase or take delivery of any gas works retort carbon, coke oven carbon or pitch coke, except under and in accordance with the terms of a permit issued under the authority of the Minister of Munitions, or sell, supply or deliver any of these materials to any person other than the holder of such a permit.

The Order of January 10, 1918, relating to gas works retort carbon is cancelled, but the validity of any action taken under it, or liability to penalty or punishment, etc., is not affected.

Applications for permits to be made to the Controller, Non-Ferrous Materials Supply, M.S. /R. /C.L., Ministry of Munitions, 8, Northumberland Avenue, London, W.C.2.

TIN.

An Order of the Minister of Munitions, dated April 26, 1918, provides that no person may buy, sell or deal in tin, situated in or outside the United Kingdom, except under licence; that no tin be used for any manufacture or work unless for an order that comes within Class "A" in the Order as to priority, dated March 8, 1917. Monthly returns, beginning this month, as to stocks, sales, deliveries and orders, are to be sent to the Director of Tin Supplies, 1, Metal Exchange Buildings, Whittington Avenue, E.C.3., and marked "Tin Licence," but no return is required when the total stock in hand or on order did not exceed 5 cwt. during the preceding month.

The expression "Tin" means tin of all qualities and includes sheet and rolled tin, tinfoil, scrap tin, tin ores and concentrates, and tin residues.

In applying for a licence to the Director of Tin Supplies, the amount and quality of metal required per month and the use to which it will be put, must be stated. [The full text of the Order is given in the *London Gazette* for April 26 and in the *Bd. of Trade J.* for May 2.]

FERTILISER PRICES ORDER, 1918.

Superphosphate, Sulphate of Ammonia and Ground Basic Slag.

This Order, issued by the Minister of Munitions on April 30, supersedes the Orders relating to superphosphates of Aug. 20, 1917, Nov. 17, 1917, and March 28, 1918, as regards sales after May 1, for delivery May 31, 1918, and operates independently of the Fertilisers and Feeding Stuffs Act, 1896. It regulates trade, fixes maximum prices, and equalises the cost of distribution by rail or water throughout the United Kingdom.

The provisions as regards maximum prices chargeable do not apply to fertilisers sold for export (other than to Channel Isles or Isle of Man), sales of less than 14 lb., sales for delivery prior to June 1, or sales of sulphate of ammonia for use in the manufacture of munitions or for industrial purposes.

Licences are required for the sale of fertilisers and for their despatch under certain conditions. Makers, dealers and users must render such returns as are required.

"Superphosphate" means superphosphate of lime, manufactured from mineral phosphates, but does not include basic superphosphate, bone superphosphate, dissolved bones, bone meal, bone compound, guano, or compound manures, and sulphate of ammonia used for manufacture of compound fertilisers is deemed used for fertilising and not industrial purposes.

The scheme for equalising costs of distribution (contained in the fifth schedule to the Order) provides for the opening by every maker or producer of the fertilisers of an account with the Government, wherein the Government is to be debited with the costs of carriage by rail or water incurred by the maker, and credited with a fixed sum of 12s. 6d. per ton (allowed for in the maximum prices fixed by the Order and meant to cover the estimated average cost of distribution), the difference being borne by the Government.

Applications for licences and all communications should be addressed to the Food Production Department, Board of Agriculture and Fisheries, 72, Victoria Street, S.W.1.

All other applications in reference to the Order and for licences for sale of sulphate of ammonia to be used in manufacture of munitions of war or for industrial purposes should be addressed to the Director of Acid Supplies, Ministry of Munitions, Explosives Supply Department, Storey's Gate, Westminster, S.W.1.

[The full text is given in the *London Gazette* of April 30.]

OIL AND FAT COMPOUND (LICENSING OF MANUFACTURERS AND REQUISITION) ORDER, 1918.

This Order of the Food Controller, issued April 17, prohibits as from April 22, the manufacture for sale of certain oils and fats, except under licence granted by him. It also provides for the requisition of the output of factories and for making returns. The Order applies only to mixtures and compounds of the following oils and fats intended for human consumption :—

Vegetable Oils.—Coconut oil, cotton oil, gingelly (sesame) oil, ground nut oil, kapokseed oil, linseed oil, maize oil, nigerseed oil, palm-kernel oil, poppy oil, rapeseed oil, shea oil or butter, soya oil, and sunflower oil.

Animal Oils and Fats.—Neutral lard, oleo oil, premier jus, tallow (beef), tallow (mutton), stearine (beef and mutton), whale oil, and lard.

OTHER ORDERS, ETC.

A Royal Proclamation withdrawing certain Certificates of Exemption from Military Service. April 23.

Raw Cotton (Fourth Census,) Order, 1918. Board of Trade. April 19.

Sale of Wool (United Kingdom) Amendment Order, 1918. Army Council, April 20.

Wool (Colonial Fellmongers) Order, 1918. Army Council. April 22.

Purchase of Hides Order, Dec. 19, 1917. Amendment. Army Council. April 29.

NON-FERROUS METAL INDUSTRY ACT, 1918.

Notice is given (April 30) that the Rule Committee of the Supreme Court has made Rules of Court under Section 1, Sub-section (5) of the above Act. Copies are obtainable on application from H.M. Stationery Office, or through any bookseller.

PROHIBITED EXPORTS.

Acting on the recommendation of the Board of Trade, H.M. Privy Council issued an Order, dated April 25, as follows :—

That the goods mentioned in the Schedule to the Proclamation of the 10th day of May, 1917, as amended and added to by subsequent Orders of Council, and marked "(C)" which are at present prohibited to be exported to all destinations in foreign countries in Europe and on the Mediterranean and Black Seas, other than France and French Possessions, Russia, Italy and Italian Possessions, Spain and Portugal, and to all ports in any such foreign countries, and to all Russian Baltic ports, should be prohibited to be exported to all destinations in European and Asiatic Russia and in other foreign countries in Europe and on the Mediterranean, except France and French Possessions, Italy and Italian Possessions, Spain and Portugal, and to all parts in any such foreign countries.

TRADE NOTES.

BRITISH.

British and American Chemical Prices.—In normal times, the difference between the price of a product in America and the price in Great Britain is roughly controlled by the cost of transferring the material from the cheaper to the dearer market. With the advent of restricted exports, this factor has been removed, with the result that the prices current in the two markets differ by much more than the cost of carriage. A writer in the *Oil and Colour Trades Journal* (April 13) gives the following examples of this in the case of some common chemicals :—

		Price in	
		New York.	Great Britain.
Bichromate of potash	lb.	1s. 10d.	2s. 3d.
Chlorate of potash	lb.	1s. 8d.	2s. 2d.
Yellow prussiate	lb.	5s. 0d.	3s. 5d.
Caustic soda	cwt.	22s.	54s. (for 70%)
Barium chloride	ton	£12 10s.	£31

These differences would, of course, be much decreased immediately shipping became generally available, and the opinion is expressed that all users of chemicals will be seriously prejudiced by any attempts to control or hinder the free exchange of the various commodities, such as are foreshadowed by the powers sought by the Board of Trade to regulate imports and exports for a long period after the cessation of hostilities.

Market for Zinc (and Sulphuric Acid) in the Madras District.—The zinc imported into this district has shown a falling off from 964,432 lb. in 1913—1914, to 511,392 lb. in 1914—1915 and only 222,768 lbs. in 1915—1916. Of the imports in the latter year, 27,552 lb. consisted of unwrought zinc or spelter, 192,416 lb. was wrought, the remainder being returned as "other sorts." While in normal years Great Britain provides the greater part of the unwrought zinc, she was easily outdistanced by Belgium and Germany in the manufactured varieties, but during the war she has taken the lead in the latter.

Zinc chloride is also imported from the United Kingdom.

A little sulphuric acid, both pure and commercial, is imported, but the supplies have fallen off from a value of £1620 in 1914—1915, to £140 in 1916—1917. The shortage of acid has encouraged a firm in the South Arcot district to undertake its manufacture, and the commercial variety has been put on the market at 5d. per lb.—(*U.S. Com. Rep., Feb.* 13, 1918.)

Chemical Trade in Calcutta.—The chief products of interest to chemical industry of this province are indigo, lac, oilseed and vegetable oils, opium and hides and skins. During 1916—1917, the area under cultivation for indigo increased by 114 per cent. to 756,400 acres, despite an unfavourable season, the yield of dye being estimated at 95,500 cwt. The exports, amounting to 13,614 cwt., went chiefly to the United Kingdom and to the United States.

Lac has been exported under restrictions on account of its use in munition work, a percentage of the product being reserved for the Government at a fixed price. 327,223 cwt. of button and shell lac were exported, and 33,478 cwt. of other kinds; about 63 per cent. going to the U.S.A. and 13 per cent. to Great Britain.

The crop of oilseeds was fairly good, except in Assam and Bengal, where the linseed crop suffered, first from heavy rain and subsequently from drought. The area under mustard and rape seed has increased 10 per cent. There were exported:—Seed: 2,015,792 cwt. of linseed, 95,101 cwt. of castor seed, 68,861 cwt. rape seed and 6140 cwt. of other seeds. Oil: 598,283 galls. of castor oil, 176,207 galls. of linseed oil, 545,439 galls. of mustard or rapeseed oil, 19,278 galls. of earthnut oil, 23,743 galls. of coconut oil and 7653 galls. of other oils. Opium exports have again fallen off in quantity, although the value increased by 43 per cent. Exports on Government account, not tabulated, increased greatly. An attempt is being made to bring the morphine content of this opium up to the Turkish standard.

The export trade in hides and skins suffered from the restrictions imposed, and the 1916—17 figures show a diminution in volume. There was a record export of hides to the United Kingdom, the prohibition against the import of these goods being temporarily relaxed. There was also an enormous increase in the export of buffalo skins, chiefly to the U.S.A.

The imports of chemical interest included:—Metals and ores (£3,000,000), oils (£1,400,000), salt (£930,000), liquors, including methylated and perfumed spirit (£480,000), chemicals and chemical preparations (£450,000), drugs and medicines, excluding chemicals and narcotics (£340,000), paints and painter's materials (£250,000), soap (£132,000), and dyeing and tanning substances (£96,000).—(*U.S. Com. Rep., Jan.* 27, 1918.)

Cacao in Trinidad.—The exports of cacoa from Trinidad during 1917 reached the record total of 70,144,898 lb., being nearly 10 per cent. higher than the previous record of 1914. The price obtained was equivalent to about 5·4d. per lb. for cacao from the big plantations as against a five years' average price of 6·3d. per lb. The cacao produced by the small growers is considered of inferior quality and fetched a slightly lower price.—(*U.S. Com. Rep., Feb.* 7, 1918.)

FOREIGN.

Commercial Museum for Mexico.—A commercial museum is to be established by the Mexican Department of Commerce and Industry, based on a reorganisation of the old museum of technical industries. The museum is intended to be a kind of clearing house, facilitating the relations between producers and merchants. Exhibits of the national products will be shown, and a special library of foreign catalogues will be installed, with clerks to make translations without charge.

There will be a chemical laboratory for the analysis and classification of any product submitted for that purpose, and a special section will be devoted to technical expositions.—(*U.S. Com. Rep., Jan.* 17, 1918.)

Japanese Export Trade in Metals.—Hardly any pig iron was exported from Japan to the U.S.A. during 1915 and 1916, the declared figures being 350 tons and 800 tons respectively. The total value of the ores and metals exported to that country was £193,000, including 6,593,349 lb. of copper ingots and slab, and 8,131,031 lb. antimony.

The exports during the period January 1—November 12, 1917, included 1,097,600 lb. of copper ingots and slab, 1,635,000 lb. of refined antimony, 336,000 lb. of antimony ore, 730,675 lb. of zinc dust, and 101,331 lb. of ferromanganese, in addition to ferrosilicon, ferrotungsten, molybdenite, scheelite, wolfram and manganese ore.—(*U.S. Com. Rep., Feb.* 4, 1918.)

Developments in Denmark.—A new company—the South American Forest Industry and Shipping Co.—has just been incorporated with a capital of 500,000 dollars to exploit tropical plantations in South America.

Cement factories, after a stoppage of several months due to lack of coal, are expected to resume work very shortly. The industry normally employs about 2500 persons, and consumes 18,000 tons of coal per month.

Since the stoppage of most of the breweries, the supplies of yeast have fallen off considerably. A separate industry for the production of yeast is now being started, the raw material being buck wheat.—(*U.S. Com. Rep., Feb.* 6, 1918.)

Norwegian Waterpower Developments.—A new syndicate has been formed at Skien to utilise a number of small falls aggregating about 200,000 horsepower. It is proposed to manufacture nitrate, aluminium, or carbide according to market demands.

The "Norsk Hydro" annual report for the year ending June, 1917, shows a profit of 6½ million dollars against 5 millions for the previous year. The company's capital is 15½ million dollars, and a total horsepower of 300,000 is operated for the production of nitrates and carbide. The waste heat from these electrochemical processes is now utilised in low-pressure steam turbines.—(*U.S. Com. Rep., Feb.* 8, 1918.)

New Iron Works in Norway.—Although Norway has produced large quantities of iron ore, very little smelting has been done in the country. Owing, however, to the impossibility of meeting present demands for iron and steel goods by importation, several companies, the largest being the "Christiania Staalverk," are now exploiting the manufacture of iron and steel. To avoid the use of coal, which cannot now be imported, it is proposed to adopt electrical smelting, the electricity being obtained from waterpower. The scheme is receiving Government support in the form of loans, subsidies and waterpower concessions.—(*U.S. Com. Rep., Feb.* 8, 1918.)

German Company for promoting the Manufacture of Substitutes.—A company, entitled the Kunst-Rohstoff A.-G., has been founded in Berlin with a capital of 1,000,000 mk. The object of the undertaking is the furthering and utilisation of processes for the manufacture of substitute products in place of foreign raw materials. (*Z. angew. Chem., Jan.* 1, 1918.)

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, April 18, 25, and May 2.)

OPENINGS FOR BRITISH TRADE.

Names of manufacturers of cider, vinegar and ink powder (writing and printing) are required.

A firm of manufacturers' agents in Sydney desires to be placed in communication with United Kingdom manufacturers or exporters of industrial chemicals, with a view to obtaining their representation in the Commonwealth immediately after the war. The lines in which the firm is particularly interested, and for which it states there is a steadily increasing demand in the Dominion, are: Cream of tartar, tartaric acid, citric acid, caustic soda, carbonate of soda, naphthalene, dyes, waxes, gelatine, cocoa, soda ash, strychnine, arsenic, litharge, butter, and lines used by brewers, tanners, photographers, soap manufacturers, etc. (Ref. No. 96.)

A firm at Hamilton, Ontario, manufacturing ammonia, naphthalene, etc., desires to obtain agencies for U.K. manufacturers of heavy chemicals, including potassium nitrate, borax, British fine salt and copperas. (Ref. No. 98.)

A Montreal firm wishes to establish connexion with British firms actually exporting from West Africa, British India, the Straits Settlements, and China, such produce as vegetable oils (edible and for soap manufacture); also shellac, gambier, jute, etc. (Ref. No. 102.)

A firm at Genoa, also an agent at Florence, wishes to represent manufacturers and exporters of chemicals. (1476 and 1478.)

The Egyptian Ministry of the Interior (Lunacy Division) has called for tenders for the supply and delivery of 6000 kilo. of laundry soap, 18,500 kilo. of arachis oil and 10,300 kilo. of washing soda, for the period of twelve months from July 1, 1918.

A London firm representing a Copenhagen company desires to obtain for a new branch of that company at Buenos Aires, catalogues and full particulars from U.K. manufacturers of, *inter alia*, chemicals and chemical apparatus. (Ref. No. 115.)

TARIFF CUSTOMS EXCISE.

Antigua.—An additional import duty of 10% has been levied on spirits, non-perfumed, and on alcoholic beverages.

Argentine.—Export prohibitions include empty casks, whole or knocked down; gold, silver, platinum, castor oil seed and castor oil.

The Board of Trade is now in receipt of a copy and translation of the revised Argentine Tariff Law. The translation is given in the *Bd. of Trade J.* of April 25.

Australia.—The Board of Trade has received a copy of the Proclamation of Jan. 10, 1918, prohibiting the importation and exportation of copra.

British India.—Exportation of castor oil is now prohibited to all countries except the United Kingdom.

By the "Indigo Cess Act," on and after April 1, 1918, all indigo produced in India is subject to an export duty of 1 rupee per maund (82⅔ lb.).

Canada.—Customs Memorandum No. 2181 B, of March 4, 1918, contains a complete list of the amendments to the import classifications. An Order in Council of March 9, 1918, prohibits, except under licence, the exportation of: ammonium sulphate, calcium carbide, electrodes, bones and other fertiliser materials, chemical and mechanical wood pulp, and certain forms of iron and steel.

France.—By the Law of Feb. 22, 1918, the general consumption duty on alcohol was raised from 400 to 600 francs per hectolitre of pure alcohol.

A Presidential Decree of April 18 prohibits the exportation and re-exportation of many articles and materials, among which are a number of chemical products.

Honduras.—A Decree was issued on Feb. 18, authorising the increase of the export duty on coconuts from $1.50 to $2 (U.S. currency) per thousand.

Italy.—By a recent Decree, the exportation of raw and worked marble has been prohibited. Export permits for consignments to the U.K. and certain other countries may be granted.

Mexico.—Recent customs decisions affect: boiled vegetable oils, of the kinds for which separate Tariff provision is not made; naphthoic acid; composition of fluid paste, asbestos, and aluminous substances, intended for filling the tubes of tyres for vehicles; composition of resins, oil, and mineral driers, for preparing colours and varnishes; mixture of the refuse of various kinds of oils in the natural state, or treated with acids, for treatment of minerals by flotation process; refined petroleum suitable for burning (gas oil) and similar oils; powdered shells of cocoa-beans for colouring and flavouring sweets.

A Decree of March 22, prescribes regulations affecting the exportation of gold and silver, and the importation of gold.

New Zealand.—New Customs Decisions have been issued which affect, *inter alia*: glass bottles, cardamom seeds (ground and unground), machines for aerating liquids.

Paraguay.—The export duty on quebracho extract has been reduced from 10 to 5 dollars (gold) per metric ton. (Paraguayan gold dollar = 4s.)

Peru.—The exportation of cottonseed is now prohibited.

Portugal.—From May 1, Customs duties are to be paid in gold on the basis of converting a variable proportion of the duty into gold at the par rate, the proportion depending on the current rate of exchange.

A Decree of March 23, regulates trade in oleaginous seeds and products derived therefrom.

Sierra Leone.—Ordinance No. 8 of 1917 regulates the sale of native produce and provides penalties for adulteration. The produce includes: palm oil, palm nuts, palm kernels, ground nuts, rubber and gum.

United Kingdom.—In accordance with the House of Commons Resolutions of April 22, the following *additions* to the duties of Customs on spirits are now chargeable:—For every gallon computed at proof of spirits of any description except perfumed spirits, 15s. 3d. For every gallon of perfumed spirits, £1 4s. 3d. For every gallon of liqueurs, cordials, mixtures, and other preparations entered in such a manner as to indicate that the strength is not to be tested, £1 0s. 6d.

The increased duties on substances containing spirit, or in the manufacture of which spirit is used, are as follows:—Chloral hydrate, per lb., 3s. 6d.; chloroform, per lb., 8s. 8d.; Collodion, per gall., £3 10s.; ether, acetic, per lb., 5s. 2d.; ether, butyric, per gall., £2 3s. 9d.; ether, sulphuric, per gall., £3 13s. 2d.; ethyl, iodide of, per gall., £1 18s. 1d.; ethyl bromide, per lb., 2s. 10d.; ethyl chloride, per gall., £2 3s. 9d.

The match-duty is raised by 50 per cent., and additional taxes are imposed on sugar, molasses, glucose, and saccharin.

United States.—Changes have been made in the regulations concerning the exportation of tin plate and articles containing tin.

The Board of Trade is now in receipt of full particulars concerning the importation into the U.S.A. of ferro-alloys, kindred ores and metals; respecting the "List of Restricted Imports No. 1"; and the importation, purchase and sale of castor beans and castor oil.

REPORT.

GAS TRACTION.

Interim Report of the Gas Traction Committee of H.M. Petroleum Executive (1d.).

The Inter-Departmental Committee appointed in November last has issued a unanimous report recommending the further utilisation of town gas for traction purposes. The following are some of the principal conclusions and recommendations (abbreviated):—

(*a*) Supply and Employment of Gas in Flexible Containers.

Safety and Simplicity.—Ordinary town-gas can be effectively, safely, and promptly substituted for motor spirit, as a fuel for use in internal-combustion engines of the types which are commonly fitted to motor vehicles, without reduction of the compression-space in the cylinders of such engines.

Economy.—It is reasonable, from a commercial point of view, to adopt a mean consumption of 250 cubic feet of ordinary town-gas (with, say, a gross calorific value of 490—500 British Thermal Units per cubic foot) as the equivalent of one gallon of motor spirit, and on this consumption-ratio gas at 4s. per 1000 cubic feet shows the same fuel-cost as motor spirit at 1s. per gallon, apart from interest on cost of installation and the maintenance of flexible containers and filling arrangements.

Gas Bags.—Flexible containers should be made of fabric which complies with the specification in the Appendix accompanying the report. The working life of such a container may be considered to be normally about eight months and this may probably be increased by as much as 50 per cent. when the material is continuously protected from the action of light, and otherwise, by a suitable covering. Leakage of gas due to the porosity of inferior fabrics may after one month of use equal the actual gas-consumption.

Supply.—It is desirable that owners of gas-undertakings should themselves be suppliers of gas for traction purposes, and that they should also allow re-sale through the intermediary of motor depots and like establishments. There should be no restrictions, except in so far as shortage of coal or other war conditions may render imposition of control or priority necessary upon the drawing of supplies of gas for traction purposes through suitable meters at consumers' premises or private filling-stations.

The erection of a stand-pipe, pillar-pipe, or any filling installation on other than private property should be subject to approval of the site by the Local Authority concerned, and, if agreement is not reached within 14 days of delivery of written notice and application, the owners of the gas-undertaking or other applicant should have a right of appeal to the Local Government Board to appoint an inspector to decide between the parties.

Measurement.—Reduction of demands upon both rationed material and labour will be facilitated by the elimination, wherever possible, from new installations of the older methods of measurement. The installation of new meters in the construction of which tin-plate is required can, we believe, in many instances, be obviated by substituting a rotary, inferential or other measuring instrument, the manufacture of which will require little or no rationed material.

Price of Gas.—The price of gas for traction purposes should not exceed the ruling price per 1000 cubic feet in any area of supply, subject to the district rates of discount (if any) according to quantity, if the supply is taken at the consumer's premises or private filling-station on any agreed system of measurement.

There should be a charge of not more than 2d. per 100 cubic feet over and above the ruling domestic rate for the area, in respect of any supplies for traction purposes which are drawn at any filling-station or depot other than at the consumer's premises or private filling-station in order to cover labour and service, with a minimum of 6d. per filling.

(*b*) Approved Uses of Gas under Compression during the War Period.

Semi-Rigid Containers.—It is undesirable that semi-rigid containers of rubber and canvas or other proofed fabric should at present be allowed to be charged with gas to a pressure greater than 90 lb. on the square inch, or should be of an larger internal diameter than 4 inches, and even with these limitations containers of this class are, in the opinion of the Committee, unsafe if not properly armoured with galvanised steel wire of 0·012 inch diameter (No. 30 B.W.G.).

Encouragement should be given to the construction and use of semi-rigid containers of rubber and woven wire, up to working pressures of 300 lb. on the square inch, and it is recommended to the Controller of Priority that he afford such assistance as may be necessary to permit developments of this description of container.

Metal Cylinders.—It is desirable to encourage forthwith, under special licence from the Board of Trade where necessary, a limited number of experiments on a commercial scale with compressed gas in rigid metal cylinders, plain or wire-wound, at pressures up to at least 1800 lb. (120 atmospheres) on the square inch, in connexion more particularly with certain of the larger motor-omnibus undertakings and the transport departments of certain of the more important municipal authorities, in order to obtain data for dealing with this post-war development.

COMPANY NEWS.

THE UNITED ALKALI CO., LTD.

At the annual general meeting held in Liverpool on April 18, Mr. Max Muspratt, the chairman of directors, said the export business of the company had suffered but the home trade was full of promise. Much of the goodwill in foreign trade, which had taken over fifty years to build up, was now in the melting pot. Although relations with labour had been cordial, difficulties had arisen from lack of experience among the new workers engaged to replace those lost by the early recruiting for the Army. Another difficulty was the great increase in the number of controllers acting for the Government. These made the running of the works extremely difficult and necessitated frequent and prolonged visits to London of many of their busiest and most important officials.

Of the gross profit of £805,641 for the year 1916, no less than £421,314 had been paid away in taxes. Although money must be found for the conduct of the war, the incidence of the burden of taxation needs revision. "With regard to income tax, there are three points which were comparatively unimportant at the pre-war level of tax, but which are very serious at the present rate, namely, inadequate allowance for depreciation, the taxation of moneys placed to reserve and placed to exhaustion of minerals account. All these are, in practice, taxes upon capital and, taken in conjunction with the Munitions Levy and Excess Profits Duty, are a serious menace to the future for undertakings such as ours, which are essential to the nation in its time of need, but which, for various reasons, had a low standard of profit based on the years immediately preceding the war." To tax

fixed capital, as distinct from its profits, is to remove the foundations of a building in order to repair the roof.

Owing to the special war taxation, the company is somewhat handicapped in regard to working capital but with this qualification the general position of the company is highly satisfactory.

The accounts for the year ended Dec. 31, 1916, show a net profit of £196,169, and a total at credit of profit and loss account of £246,548. Of this sum £223,019 has been paid in dividends (including 15 per cent. on the ordinary shares), leaving £23,529 to be carried forward.

ELECTRO-BLEACH AND BY-PRODUCTS, LTD.

Speaking at the adjourned third and the fourth annual meeting at Manchester on April 21, Mr. H. J. Mackinder, chairman, made some trenchant remarks concerning the Excess Profits Duty. This duty involves young and vigorous companies in increasing injustice. His company was being mulcted, not of profits which had come to them through the war, but which were the result of natural growth. A 9 per cent. standard sounded quite a good thing to the general public, but the latter should know that industrial companies require a very large return on their capital in order to continue developing and to make provision for future uncertainties. Thus, their company had almost entirely reconstructed the equipment and mechanical power of the original Electrolytic Alkali Company of 20 years ago, but it was still necessary to make ample provision to keep abreast of scientific and mechanical progress.

The company's supply of brine and other raw materials was adequate, but they were taking the precaution of sinking another bore to their brine deposit in order to meet future requirements.

The accounts for 1916 show a profit of £19,497, after meeting the Excess Profits Duty for two years, depreciation, etc., and an available balance of £24,219, out of which £15,301 was paid for interest, dividend on preference shares and preliminary expenses. The profit for 1917, after deducting the Excess Profits Duty for one year, was £25,902. The preference shares received 7 per cent. for the year, and the ordinary shares 10 per cent. £6000 is placed to reserve and £1670 carried forward. The issued capital is £180,000 and there are £56,000 debentures outstanding.

THE NEW TRANSVAAL CHEMICAL CO., LTD.

The twenty-second ordinary general meeting was held on April 23 in London, the chairman of the company, Baron E. B. d'Erlanger presiding. The accounts for the year ended June 30, 1917, show that on an issued capital of £534,892, a profit of £74,136 was made. The directors have transferred £7764 to depreciation account, 6 and 8 per cent. have been paid on the first preference and "A" preference shares respectively, and 20 per cent. on the ordinary shares, leaving a carry forward of £11,112.

Baron d'Erlanger in this speech said it was their policy to make South Africa as self-supporting and self-contained as possible. The New Transvaal Chemical Co. was the first to make the Union independent in respect of sulphuric acid for the mining industry. It next made the country independent of the imports of candles for mining and for the general public, and then furnished the whole population of South Africa with home-made soap. At the present time it is endeavouring to make the country independent of the importation of boxes for packing.

REVIEWS.

Carbon Assimilation. *A review of recent work on the pigments of the green leaf and the processes connected with them.* By Ingvar Jorgensen *and* Walter Stiles. *New Phytologist reprint, No. 10. Pp. 180. (London: Wesley and Son, 1917.) Price 4s. net.*

The pamphlet under review gives a critical account of modern work on the chemistry, physics and physiology of that process which is the most striking attribute of green plant cells, the process by which carbon dioxide is reduced and condensed to that sugars and polysaccharides, food materials of high energy content, arise in abundance within the cell. This work may well be recommended so those who are not biologists, but have a general physico-chemical interest in this subject, because the different aspects of the subject are adequately presented from the standpoint of physics and chemistry, and because the authors do not set out at any length the early stages of work which are now only of historical interest, but confine themselves to expounding as carefully as possible the present frontiers of knowledge.

The chief chemical aspects that have to be dealt with are the nature of chlorophyll, the theories of the photosynthetic process and the determination of the resulting carbohydrates.

In 1862, Sir George Stokes asserted that there were present in the green leaves four pigments, two green and two yellow, though he never published the evidence by which he satisfied himself of this. Then followed fifty years of chaotic investigation in which every possible view except this found some one to support it. Now it is finally settled by the monumental investigations of Willstätter and his colleagues that Stokes' view was the correct one. The nature and properties of chlorophyll are now known to be such as no worker had suggested before Willstätter untiringly worried them out. In every leaf there are present two chlorophylls and no more, and these apparently differ only in that chlorophyll (b) has one more oxygen atom, replacing an equivalent of hydrogen in chlorophyll (a). These two green components are present in about the same relative proportions in all leaves and they give rise to two parallel series of derivatives when chemically treated *in vitro*. Both are esters of a monohydric alcohol of high molecular weight, phytol, and yield on hydrolysis 30% of phytol, together with a tricarboxylic acid which contains four pyrrole rings. The magnesium, which Willstätter was the first to discover, is believed to be combined with the nitrogen, and this led Willstätter to suggest an analogy between the organic synthetic power of chlorophyll and Grignard's reaction; a speculation that he seems now to have withdrawn.

The yellow pigments are as different in constitution from the green as is possible; carotin being an unsaturated hydrocarbon and xanthophyll an oxidation product of it. Both when isolated spontaneously absorb oxygen up to 30 per cent. of their weight. That there are thus two grades of oxygen-potential present among the yellow pigments as well as with the green ones suggests that this differential character should be associated with the reduction process taking place in the green cell, but no evidence has been obtained on this point.

In spite of so much excellent chemical work on chlorophyll, we have as yet no trustworthy clue to the nature of the complex system of reactions by which the reduction and condensation of carbon dioxide are carried out in the green cell. The "formaldehyde theory" of Baeyer lacks experimental support though it has an attractive simplicity. It may even be ultimately found that we are on a wrong track in attributing the

reduction mechanism for carbon dioxide *primarily* to light or to chlorophyll, as it is well established now that the protoplasm of many bacteria can reduce CO_2 and form organic matter from it, though unpigmented and in darkness. This is effected by what plant-physiologists have called "chemosynthesis" (as opposed to "photosynthesis") in which the chemical energy set free in oxidising ammonia or nitrites, sulphur or hydrogen sulphide, or even hydrogen by the bacteria is utilised by them in effecting the synthesis of carbohydrates.

On any view, we are driven to admit the complexity of the whole reaction-system; it is certain that dark reactions enter into it as well as photochemical reaction, and the often cherished expectation that it would be possible to achieve a sort of photo-synthesis by the action of light and pure chlorophyll on carbon dioxide *in vitro* is now abandoned. F. F. BLACKMAN.

ZINC ORES. *Imperial Institute Monographs on Mineral Resources with special reference to those of the British Empire. Pp.* 64. *(H.M. Stationery Office.) Price* 2*s. post free.*

Although not such a glaring instance, nor quite parallel with the notorious examples offered by the basic process for the manufacture of steel and the discovery of coal-tar dyes, the European zinc industry is one of those initiated in England, which either through the possession of certain natural resources or greater business enterprise, has made far greater progress on the Continent (notably Germany) and contributed enormously to the prosperity of others rather than to the pioneer country.

In the years immediately preceding the outbreak of war, the consumption of spelter in the United Kingdom amounted to about 200,000 tons a year, of which nearly 75 per cent. (*i.e.*, 145,000 tons, valued at £3,460,000) was imported. The consequence was that, at the outbreak of war, although the British Empire produced, and British capital controlled, a large proportion of the world's raw material (zinc blende), not only was this country cut off from its usual sources of supply of spelter, but many of the mines in Australia and elsewhere had to close down temporarily because there was no plant available for smelting their produce. The total annual tonnage of zinc concentrates produced in New South Wales alone amounted to about 370,000 tons containing about 145,000 tons of extractable zinc metal, practically the whole of which went to Germany and Belgium. This condition of affairs had resulted for no particular economic reason; the cost of smelting zinc being probably very similar in all smelting centres in normal times. The Germans had secured their trade by greater business and metallurgical enterprise, assisted by banking facilities and shipping subsidies.

The present monograph is the first of a series arranged by the Mineral Resources Committee of the Imperial Institute. It comprises a useful summary of the zinc-ore resources, actual and potential, of the British Empire and foreign countries, and contains statistics showing the world's production and consumption of spelter and ores.

At the present time the United States holds the premier position as a producer of zinc ore and spelter, and an interesting development, since the war, is the large increase in the production of electrolytic zinc.

The monograph concludes with a few short notes on the valuation, concentration and smelting of zinc ores, and attention is drawn to the acknowledged desirability of more fully recovering, as sulphuric acid, the sulphurous fumes evolved during the roasting of the zinc blende.

WILLIAM G. WAGNER.

PUBLICATIONS RECEIVED.

CHEMISTS' POCKET MANUAL. *By* RICHARD K. MEADE. *Third Edition. Pp.* 530. *(Easton, Pa.: The Chemical Publishing Co. London: Williams and Norgate,* 1918.) *Price* 15*s.*

CHEMICAL FRENCH. *An Introduction to the Study of French Chemical Literature. By* M. L. DOLT, PH.D. *Pp.* 398. *(Easton, Pa.: The Chemical Publishing Co. London: Williams and Norgate,* 1918.) *Price* 15*s.*

AMERICAN LUBRICANTS. *From the Standpoint of the Consumer. By* L. B. LOCKHART. *Pp.* 236. *(Easton, Pa.: The Chemical Publishing Co. London: Williams and Norgate,* 1918.) *Price* 10*s.*

THE MANUFACTURE OF SULPHATE OF AMMONIA. *By* G. T. CALVERT. *Second Edition. Pp.* 153. *(London: Benn Bros., Ltd.) Price* 7*s.* 6*d.*

THE MANUFACTURE OF INTERMEDIATE PRODUCTS FOR DYES. *By* J. C. CAIN, D.SC. *Pp.* 263, 25 *illustrations. (London: Macmillan and Co., Ltd.,* 1918.) *Price* 10*s.*

MEMOIRS OF THE GEOLOGICAL SURVEY. *Special Reports on the Mineral Resources of Great Britain. Vol. III. Gypsum and Anhydrite, by* DR. R. L. SHERLOCK *and* B. SMITH; *and Celestine and Strontianite, by* DR. R. L. SHERLOCK. *Second Edition. Pp.* 64. *(London: H. M. Stationery Office.) Price* 2*s.*

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The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

THE UTILISATION OF OPEN HEARTH BASIC SLAG.

Some fifteen months ago Professors Gilchrist and Louis drew attention to the urgent importance of utilising for fertiliser purposes the vast quantities of open-hearth basic slag which existed or were being produced in this country (this J., 1917, 261). They pointed out that the neglect of this by-product of steel manufacture was due mainly to the circumstance that the availability of the phosphoric acid content was very low as compared with that of the basic slag obtained by the Basic Bessemer process, when both were determined by the citric acid solubility test; that this test is a purely empirical and arbitrary one, having no direct relation to field conditions; and that the popularity of the test was to be ascribed to German business acumen, for Germany produced about seventeen times as much Bessemer slag and only about twice as much of open hearth slag as we did, and her steel manufacturers have been able to reap a rich harvest from the sale of this by-product.

In view of the commanding position which Bessemer slag had held hitherto, and of the fact that of the twenty-five firms which make basic slag in this country, only a few produce the open-hearth variety, it was scarcely to be anticipated that any rapid headway would be made at the outset. Nevertheless we are pleased to be able to record that very considerable progress has been effected. A year ago the total production of ground basic slag, available for agriculture, was estimated at 400,000 tons for the period April 1917—18. The actual quantity produced was about 25 per cent. in excess of this estimate. The increase was due to the pressure exercised by the Minister of Munitions with the object of augmenting the quantity of low grade slag which was being ground. This satisfactory achievement was accomplished in spite of many difficulties, among which railway transport and the provision of the necessary facilities for grinding may be specially mentioned. Owing to the concerted action of the Food Production Department and of the Board of Agriculture no trouble has been encountered in getting the farmers to use this slag, and as the demand continues to be much in excess of the supply, there is little doubt that the further increased production forecasted for the coming year will be readily absorbed. In view of the enormous estimated annual production of open hearth slag, 750,000 tons or more, the above-mentioned increase may not appear to be very great, but it must be borne in mind that much of it is of far too low a grade to bear the costs of handling, milling and transportation, especially at the present time. Seven per cent. total phosphoric acid is now regarded as the minimum payable grade, but in point of fact no slag containing less than 8 per cent. is now being utilised. Moreover the production of open hearth basic steel in this country is continually on the increase.

That the authorities are convinced of the efficacy of open-hearth slag is evidenced by the Order issued on April 30 last (this J., 1918, 182 R). In the third schedule, which gives the maximum prices of ground basic slag, the grade is specified in terms of total phosphate, calculated as tribasic phosphate of lime, and references to citric solubility are conspicuously absent.

Since the publication of the paper above referred to, G. S. Robertson (J. Bd. Agric., Jan. 1918) has adduced additional evidence in favour of the contention that low grade open-hearth basic slag and also rock phosphate, when ground sufficiently finely, are valuable fertilisers for pasture land, and that their efficacy cannot be stated in terms of citric acid solubility. Prof. D. A. Gilchrist, who has done much of the pioneer work on the purely agricultural side, has recently undertaken a series of trials at Cockle Park to determine the relative values (on poor grass land and on soil sown with wild white clover) of high grade basic slag of high citric acid solubility and low grade basic slag of low citric acid solubility, and also the effect of grading up the latter by adding Tunisian phosphate to the contents of the open-hearth furnace.

Practically all the experimental work done up to the present has been performed on grass land and the effect on arable land has yet to be ascertained. At the present time, however, this is not an urgent matter as there is an abundant and increasing supply of superphosphate, the use of which has been restricted to arable land. There is also scope for experimental trials to determine the relative value of low grade open-hearth slag on different types of soil, for there is some evidence that it is more effective on the heavy soils of the north of England than on the lighter soils of the south. In view of the agricultural renascence which is everywhere apparent in this country, there is little doubt that these investigations will be duly taken in hand; in the meantime the fact of outstanding importance is that serious and successful efforts have been made to utilise a by-product which was formerly relegated to the scrap heap, or used merely as a road metal.

THE USE OF SAWDUST IN PAPER MAKING.

From the recent statement of the President of the Board of Trade in the House of Commons concerning the utilisation of sawdust in paper manufacture, it appears that necessity has forced us to make use of a raw material which has long been known as an obvious potential source of fibre. For some years past our daily newspapers have been printed on paper containing up to 80 per cent. of ground wood known as "mechanical pulp"; and that sawdust has not been utilised before as a source of fibre is due to considerations which are generally known. The present shortage of raw materials, together with the artificial values and prices obtaining, make the utilisation of sawdust and other wood wastes a commercial possibility, for the price of "mechanical pulp" is now in the region of £35 per ton as compared with the pre-war figure of, say, £5, and the value of wood (cellulose) pulps has appreciated *pari passu.*

The considerations which in the past have been sufficient to put this raw material out of bounds, were: the short and variable length of fibre, the want of cleanliness, and the cost of carriage of bulky material; otherwise it has been known for a very long time that it can be resolved, more or less, into cellulose, and, therefore, be made available for paper making. In 1810 a book, dedicated to King George III., was made entirely from sawdust by one Koop, a papermaker of Bermondsey, and what was possible at the time of the Napoleonic wars is of course feasible now: but nevertheless it must be emphasised that sawdust as such is not to be thought of, *i.e.*, as a substitute for the wet ground pulps.

Various methods are available for treating the raw materials of paper manufacture in order to remove lignone components, and in proportion as the properties of these materials approximate to those of cellulose they would find an increased range of application. Five years ago sawdust would have been regarded at the best as a means

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to a very poor filling, but *tempora mutantur*, and before long we may also be utilising bracken fronds, hop-bine and other fibrous, vegetable waste matter. Probably the only kinds of sawdust immediately available as sources of pulp-cellulose are those from coniferous woods, since the ultimate fibre of foliage woods, such as beech and elm, is too short except for use as a mere filling. Between these two extremes there are numerous possible intermediate products, in hydrated forms, and a variety of possible ways of bringing about this necessary condition of the material.

In a recent issue of The World's Paper Trade Review, Mr. R. J. Marx suggests that the foreign substances in the crude sawdust should be eliminated by passing the sawdust through a large blower, a process which would also permit of the sawdust being graded. He further states that a preliminary hydration of the sawdust should be effected by means of waste alkali, and if this be not possible then by a prolonged soaking in water. Increased hydration and better mechanical condition can be brought about by the use of beating engine refiners. The type in which one stone revolves against another in a horizontal spindle has proved very successful in Europe, especially in Sweden, but not in the United States or Canada. In America a refiner is used which is essentially a basalt lava stone beater roll and a similar bed-plate; it is far more effective in its action than that used in Europe because the sawdust passes repeatedly under the roll instead of once only. If all the sawdust in this country could be brought to one place, says Mr. Marx, one blower and five or six beating engine refiners would probably be sufficient.

The use of sawdust in paper manufacture is at present conditioned by the means of transportation. Apart from this consideration its utilisation will no doubt continue so long as home-grown timber is cut down in large quantities and the sawmills are willing to part with it for next to nothing; but when normal conditions return it is difficult to conceive that any paper-maker would prefer to use wood pulp made from sawdust to first-class mechanical pulp run on the approved system at £5 per ton, or under, delivered at his port or mill.

THE DESIGN OF LABORATORY DRYING APPARATUS.

H. DROOP RICHMOND.

A not inconsiderable portion of the work of a technical analytical laboratory consists in drying for the quantitative estimation of a loss designated "moisture," "loss at 100°," "water" or some such term, or of a residue which is usually termed "total solids." For the removal of large proportions of water or other volatile liquid, distillation or evaporation on a water bath is a satisfactory method, for the quantities dealt with are so small that methods which would be extravagantly wasteful on a large scale can be employed; but for the removal of the last traces of moisture, etc., the methods are less satisfactory, and the apparatus used is often hopelessly unscientific in design, and fails to attain the object of removing all the volatile matter in a short time without causing such changes in the non-volatile portion as result in the formation of volatile products.

The most obvious and simple method of removing moisture would seem to be to supply sufficient heat as will keep the material at the boiling point of water and to allow the steam to escape; this method is, however, based on a very incomplete consideration of what evaporation really is.

The removal of water as vapour consists (i.) in raising to a temperature at which the vapour and pressure is above the partial pressure of water vapour in the surrounding atmosphere, and it can diffuse freely, (ii.) in the removal of the water vapour so as to keep the pressure constantly above the partial pressure, and (iii.) in the continued supply of sufficient heat to convert the water into vapour; of these (ii.) is the most important.

It will happen always to a greater or less extent that diffusion is slow, either from close packing of the material or from the water being enclosed, *e.g.*, in cell walls of vegetable tissue, or in solid solution in a colloid, or in the interstices of a crystal, and consequently evaporation proceeds at a very slow rate.

Very many substances undergo chemical change at 100°, often enhanced by the presence of water, and if the evaporation of the water is slow, the amount of chemical change may be appreciable, and this change may give rise to volatile products which in turn may increase the chemical change; this is no mere hypothetical condition, but one which is of not uncommon occurrence.

If either the temperature at which heat is supplied is raised, or the pressure in the space into which the vapour diffuses lowered, the temperature being constant or even lowered, the rate of evaporation is greatly increased, and the chemical changes due to heating can be greatly decreased by shortening the time during which the substance is submitted to heating, and still more so if the temperature be lowered; and increased temperature of the heat supply need not increase the temperature to which the material is exposed so long as water in being driven off. The rate of evaporation is increased if the rate of diffusion of water vapour is augmented.

From these considerations it is apparent that the ordinary water oven is very inefficient, for vaporisation is slow owing to the lack of means of escape for the water vapour; when a current of air is passed through diffusion is greatly increased, though the rate of evaporation is somewhat diminished; in a vacuum apparatus (cold) evaporation is slow, but diffusion is moderately rapid, though this is checked by the vapour pressure of the water vapour, if means are not adopted to remove this rapidly.

The essentials of an efficient drying apparatus should be:—

1. A source of heat at such temperature that chemical change in the material to be dried is small.

2. Good conduction from the source of heat to the material to be dried.

3. A pressure less than the vapour pressure of water at the temperature of the drying material, but not sufficiently less to cause violent ebullition, and mechanical loss.

4. A large condenser to cool rapidly the vapour below the temperature at which it condenses at the pressure and preferably as low as possible.

5. Ease of opening and closing, and a rapid reduction of the pressure after closing.

No one design of apparatus will fulfil all these essentials for all substances; for instance sodium chloride, containing moisture in the interstices of the crystals could be dried at a high temperature without change, while a solution of fructose containing inorganic acids, which retains moisture in solid solution, would undergo marked change at fairly low temperatures, but a general design of apparatus for drying which could be modified simply to suit most purposes would consist of:—

(i.) A vessel in which high pressure steam, steam at atmosphere, alcohol or other vapour, water at a constant temperature, electrically heated wires or even hot air is used as a source of heat.

(ii.) A series of tubes, *e.g.*, $2\frac{1}{2}$-inch steam barrel, passing through this vessel with an open end which can be closed by a cap made tight by an india rubber, asbestos or other ring, and which can be held in position either by a clamp or other device, or by the difference of pressure between in and outside, provided with an inlet tap.

(iii.) To the other ends a cock leading to a main which connects with

(iv.) A large and efficient condenser cooled by water, ice or cold brine.

(v.) A large receiver for condensed moisture which also serves as a space to prevent local variations of pressure.

(vi.) A vacuum pump of any efficient design.

Such an apparatus, which can be easily constructed by a fitter and tinsmith, serves for drying not only the ordinary materials tested in the laboratory in a short space of time, but can be used for easily oxidisable substances, and by the use of high pressure steam most precipitates collected on Gooch crucibles can be brought into a condition for weighing. By the use of a number of tubes with cocks to them only one section need be opened at a time without disturbing the others.

There still remains one question to be considered, *viz.*, the supply of heat to the material to be dried; in a laboratory apparatus one never knows the actual temperature at which the material is or even whether it is all at the same temperature, but the point to be arrived at is to ensure that the amount of heat necessary to maintain the unknown necessary temperature is rapidly transmitted. Practically speaking the amount of heating by a hot vapour to a material is small compared with that due to a hot solid, for although the specific heat capacity of the vapour, *e.g.*, hydrogen, is high, its density is small, and the product of the two which may be termed the volume specific heat is low, and also vapours are bad conductors, though good convectors. In designing a drying apparatus, especially a vacuum apparatus, it must be remembered that practically all the heating is done by conduction, and the vessels in which the material is dried must be in as close contact as possible with the hot walls of the drying chamber, and should be made of a good conductor; for this reason platinum, aluminium or nickel dishes are preferable to porcelain or glass, where their use is possible.

As it is advisable to have a removable tray on which to place them, this should be a good conductor and designed to touch both walls and vessels as closely as possible; if the heating vessel is a circular tube the section of the tray should be bounded by an arc and chord of a circle of the same diameter as the tube, and the inside of the tube and the bottom of the tray should both be smooth to ensure contact.

In the condenser the rapid transference of heat from a vapour to the walls should be aimed at, and this points to the surface being as large as possible, and preferably painted dead black. The walls of the condenser should be of good conducting material. A Liebig condenser is very inefficient and should not be used. A condenser with about five times as much cooling surface as there is surface on which the vessels containing the material to be dried are supported, should be provided.

HIGH TEMPERATURE RESEARCH.

C. R. DARLING.

So much has been said and written on the subject of "research" since the commencement of the war, that some diffidence may well be felt in returning to such a well-worn topic. On the one hand, the academics have severely scolded the manufacturers for their backwardness in regard to research; and on the other hand the scholastic scientists have been reminded that they have kept aloof from industry, and have contributed little of commercial value. A better understanding now exists between the two, which it is to be hoped will be permanent, as upon their mutual co-operation the future of British industries will largely depend. In searching for a line of investigation in which exponents of "pure" and "applied" science could work together advantageously, it would be difficult to find one more suitable, or one that gives greater prospects of success, than systematic research at high temperatures. It is proposed in this article to indicate briefly the results already achieved in this direction, and to point out a few of the possibilities that lie before the future investigator.

For the purpose of this article, a "high temperature" will be defined as one not attainable on a practicable scale by the combustion of ordinary fuels in air—say 1600°—1700° C.—but which may be reached in regenerative gas furnaces. On tracing each method of exceeding this temperature as it has arisen, it will be found that numerous applications have in each case followed, and continue to grow in number. Thus the oxyhydrogen blowpipe furnished the means of smelting platinum and kindred metals, and has later been applied to the welding of metals and the working of vitrefied silica. The oxy-acetylene flame, which gives a still higher temperature, is now indispensable for plate-burning and for welding iron, aluminium, and other metals. The aluminium reduction process, or "thermit" reaction, has also been applied to welding, and additionally has given rise to a method of producing carbon-free metals and alloys, which are of the greatest value in the production of high-class steels. The electric furnace, however, which yields the highest temperature of all, has greatly exceeded the other methods in respect to the variety of its applications. The classic work of Moissan commenced in 1892, the first experiments being conducted in a crucible of 2 c. cm. capacity with carbon electrodes 8 mm. in diameter. From this small beginning have arisen important industries such as the manufacture of graphite, calcium carbide, cyanamide, and artificial abrasives such as carborundum and alundum; the extraction of metals from their ores in countries where fuel is dear and water-power is cheap; and the refining of steel, which, even in this country, is extending at a rate that is not generally realised. One has only to take a retrospect of the last twenty years to realise the enormous influence of high-temperature methods on industries generally, and to form the conclusion that the future will see still greater advances in this direction. At this time of national stocktaking it is therefore necessary to consider how this country stands at present with respect to its resources in relation to high-temperature industries; and also, which is equally important, what steps may be taken to ensure that some of the future developments may be credited to Britain.

The one high-temperature industry to which we can lay claim, both with regard to initiation and development, is that of vitrefied silica, and for this we are indebted to the Silica Syndicate, which has specialised on the transparent variety,

and to the Thermal Syndicate, which has devoted itself to the production of the cheaper, opaque kind. The patient investigations made on the manipulation of these materials has been well rewarded, as each advance in methods of production has met with extended applications; and the history of vitrefied silica furnishes a striking example of the value of high-temperature research. Starting as a laboratory curiosity, it has now become practically indispensable in many modern industrial processes; and this, in epitome, is the history of discoveries in general. The credit, however, is due not only to the discoverer, but equally to those who bridge the gap between the laboratory and commercial production, and who, in the past, have not received their fair share of recognition.

Apart from the foregoing example, however, Britain has little to its credit in the direction of high-temperature research, and this is probably due to the belated introduction of electric-furnace processes in this country. Until quite recently the only important industry involving the use of the electric furnace was the reduction of aluminium, and apparently this field of operations had been conceded to countries in which water power was plentiful. It has now been found that certain operations, such as the refining of steel, can often be conducted to such advantage in the electric furnace that the cost of the current is more than compensated by the improved value of the product; and at the present time the use of electric furnaces is spreading rapidly in this country. How far we shall be able to compete in the future in the case of products in which the cost of power is the determining factor, depends upon the success or otherwise of the large-power schemes now projected. It is not proposed here to enter into details of the possibilities in this direction but even assuming that in some cases we should be placed at a disadvantage, it will still be necessary to develop the electric furnace in this country, in view of the vastly extending field of its operations. In particular, electric furnace research, on a scale sufficient to give indications of commercial possibilities, should be commenced without delay. To emphasise this point it is only necessary to consider what has already been achieved by subjecting common materials to the temperatures attained in the electric furnace. Coke and lime give calcium carbide, which in turn yields acetylene and cyanamide. Coke and sand give carborundum, an abrasive now used throughout the world; and the fusion of bauxite gives another abrasive, alundum, which has practically superseded other materials for the grinding of steel, and additionally forms a useful refractory. Amorphous carbon yields graphite, which is now invaluable in electrolytic processes, and has proved to the best material for filling dry voltaic cells. It is not too much to say that these products have revolutionised many industries, and yet they represent only the beginning, and further research is sure to disclose other materials which will play a part in the work of the world. Apart from this line of work, there are other directions in which electric-furnace investigations are needed. Amongst these may be mentioned the melting of tungsten on a reasonably large scale, and a thorough examination of the possible alloys of the high-melting point metals tungsten, tantalum and molybdenum, from which valuable results might be expected. At present the difficulty of conducting such work is due to the absence of a suitable refractory, but here the electric furnace itself might furnish the solution. Another promising line of work is in the production of alloys of other metals which cannot be obtained in fuel-fired furnaces. Other suggestions might be added; but sufficient has been said to show the potentialities of electric-furnace research. It should be emphasised, however, that the facilities provided should enable the investigator to work on a sufficiently large scale, as otherwise much of value might be missed. Moissan, for example, observed the formation of silicon carbide, but it was left to Acheson, working on a larger scale, to discover its cutting properties and to introduce it into the workshop. It was also Acheson who noted, in a large carborundum furnace, crystals of graphite which had formed at the hottest part, and which would probably not be observed on the small scale; and this led to the large-scale production of artificial graphite. At present, research work of this kind is practically confined to America, and is carried out both at works and educational institutions. In this country, practically nothing has been done so far, although a start is being made at Sheffield University by the erection of an electric furnace in which experiments on steel may be carried out. It is high time that facilities for electric-furnace research were widely extended.

As the industrial future of Britain must always depend upon fuel, continued research upon the possibilities of producing high temperatures by combustion is desirable. In burning a mixture of coal gas and air, for example, the temperature produced is much greater, as Bone has shown, when the combustion occurs in the pores of a solid than when burning with a flame in the ordinary way. A compressed mixture gives a still higher temperature; thus on firing the charge in a gas engine a temperature of 2000° C. is reached, as shown by the measurements of Callendar, Dalby and others. Sir Robert Hadfield has recently called attention to some early experiments of Bessemer, in which pressures of about 100 atmospheres were used, and has suggested that these investigations should be continued. If it were possible to produce a temperature of 2300° C. on the large scale by the burning of gas, carborundum and alundum might then be made without resorting to the electric furnace. This result might be achieved if the air were enriched with oxygen and burnt under high pressure—but in any case further research in this direction is desirable. It may be mentioned that if cyanamide were manufactured in this country oxygen would be available as a by-product, and might be used for enriching the air used for the combustion of solid, liquid, or gaseous fuels. One result of conducting metallurgical and other operations at enhanced temperatures would be that less time would be needed for most processes, and thus production would be expedited.

It being agreed that high-temperature research is on all grounds desirable it remains to be considered how it could best be carried out. With regard to electric-furnace research, matters would be greatly simplified if cheap power were generally available, as will be the case if the scheme recommended by the Ministry of Reconstruction's Coal Conservation Committee comes into being. In the meantime, a beginning might be made at educational establishments which have access to power, and which have funds at their disposal to cover the cost; and large industrial firms employing electric furnaces might with advantage erect a small one for experimental work. One hesitates to suggest the formation of a committee unless it could be composed of live men, and unfettered by red tape. Research of this kind would be of a character in which the academic and industrial elements could work together to mutual advantage, and there is little doubt that the results would more than justify the outlay. A similar procedure might be followed with high-temperature work in connexion with fuels, the commercial possibilities of the results being made a prominent feature. Another field of research may be found in connexion with thermite reactions,

which have by no means been fully investigated, and valuable results might be looked for in this direction also.

A suggestion has beeu made for the establishment of a Central Institution for Industrial Research, and certain advantages would no doubt accrue from an institution of this character, which could act as a centre of information. It would be a fatal mistake, however, if manufacturers grew to rely upon the work of any organisation of this kind, and relaxed their own efforts. The best results are always obtained in connexion with research by individual work; and the more the workers the greater the output. High-temperature research, from its diverse character, should never be stereotyped at any single institution, but should be as widespread as possible. It is sincerely to be hoped that the necessary funds will be forthcoming to enable any competent worker to carry out investigations, for the future of industry will be largely associated with high temperatures. It is hoped that this article will help to create a wider interest in this all-important branch of industrial research.

CHEMISTRY AT THE INDIAN SCIENCE CONGRESS, 1918.

In his presidential address to the Chemical Section of the Fifth Annual Indian Science Congress held at Lahore in January last, Dr. Gilbert J. Fowler first referred in sympathetic terms to the deaths of Dr. E. G. Hill, Principal and Professor of Chemistry at the Muir College, Allahabad, and of Mr. J. H. Barnes, Principal of the Agricultural Research Institute, Pusa, and then spoke upon "The Training of Students in Applied Chemistry."

Primitive industries, although they often involve chemical processes, thrive without applied chemistry. Such an industry is the preparation of shellac, lac-wax, and lac-dye from stick lac, an exudation of the lac insect (*tacchardia lacca*) on certain trees. The native products are not, however, of standard quality, and if uniform and different qualities are required for special purposes, as for hats and gramophone records, expensive machinery must be erected; and then the question of "critical output," *i.e.*, the production of sufficient material to pay for initial cost, needs to be considered. Here begins modern industry. Similarly in the manufacture of soap, when the maker of "whole" soaps wishes to make a "fitted" soap, and recover the glycerine, problems of capital, output, and control arise.

There is no intermediate stage between the primitive method and the modern factory; and standardisation is the keynote of modern as contrasted with primitive industry. It is for standardised processes that the student of applied chemistry is required. So the question arises as to what sort of a man this student should be, and how he should be trained. In spite of the multiplication of chemical schools and the increasing bulk of published researches, it may be questioned whether more real chemists are being produced than formerly, when there was greater thoroughness in a more restricted field. Especially may it be doubted whether proportionately more men suitable for applied chemistry are being produced, and whether there is a clear idea of the type of man that is needed.

The most important possession of an industrial chemist is the faculty of "technical sense." Pure research is unconditioned, but applied chemical research is conditioned by the factor of *cost.* "Cost sense," however, is only a part of technical sense. Something more is needed than the criticism of a new proposal that "it can never pay." Technical sense supplies this something more. It recognises difficulties, but can distinguish between those which are inherent and final, and those which can be overcome by further research or adaptations of existing knowledge. The industrial chemist, with technical sense, sees possibilities that others cannot see, and knows how to employ them. So he can translate a process from the laboratory bench to the works. The separation of a precipitate from a liquid, for example, is one proposition when the material is in a beaker, but another proposition when the precipitate weighs a hundred tons and the liquid measures a million gallons. The latter operation involves a knowledge of chemical engineering, and thus the question arises as to how far the student of applied chemistry is to be trained as an engineer, and how far as a chemist.

After a close association of twenty years with engineers and a knowledge of their attempts to solve problems of applied chemistry, Dr. Fowler was of opinion that the professions of engineer and chemist are distinct; and that if the chemist poses as an engineer, or especially the engineer as a chemist, trouble must arise. But the chemist should know enough of engineering to direct the engineer, and the engineer enough of chemistry to understand the chemist's requirements. Nevertheless the chemist and not the engineer should be the captain of the ship of chemical industry; for whilst the engineer carries out, the chemist directs; and the higher the quality of chemical control the more successful the works. Moreover, if the engineer rather than the chemist is director, stagnation and inertia result, as in the gas industry with regard to by-products before the stimulus of the war. The design of works and plant requires the close collaboration of chemist and engineer; the engineer takes the greater responsibility for erection, the chemist for operation. Consequently the works chemist must possess not only scientific and technical knowledge, but a knowledge of humanity; he must understand and sympathise with his workmen. "Science is measurement;" and so the chemist's work may consist in giving numerical expression to the workman's intuitive knowledge. There should be mutual respect, and willingness to learn on both sides, and every man must be made to feel that he has his part to play in the working of the whole organisation, of which the chemist is the directing brain.

Dr. Fowler concluded his address by inquiring how the right type of industrial chemist could be produced. The spirit of the education is more than the programme. A sound foundation of chemistry, physics and mathematics should be laid; and the technical applications of the principles of the law of mass action, the phase rule, catalysis, etc., should be studied; but in addition there should be a social education in the direction of a wide and generous humanity.

It is well for a student to "worry through" some operation on a semi-technical scale, and then subsequently to receive instruction in chemical engineering. Thus he will the better appreciate difficulties, and be more likely to develop the necessary "technical sense."

These methods are at present being tried at the Indian Institute of Science, and examples of industrial research are being worked out. For example, a complete model of an acetone fermentation plant has been installed; the sandal oil industry of Mysore has been successfully investigated; and the production of soap will shortly be transferred from the Department of Applied Chemistry to a new factory in Bangalore.

The goal of all these efforts is a live and sane industrialism founded on active and trained intelligence, and containing within itself the potentiality of indefinite expansion.

Amongst the papers of chemical interest subsequently read at the Congress were the following :—

Cocoanut : The Wealth of Travancore : by N. Kunjan Pillai.

The prosperity of the cocoanut industry was shown to depend upon methods of cultivation, including manuring and the treatment of pests and diseases. The development of the industry, and the manufacture of articles from the raw products, which are now chiefly exported, would result in great increase of national wealth.

The deterioration of the indigo soils of Bihar : by W. A. Davis.

The yield of indigo has decreased within the past year in spite of an increased area under cultivation. This is attributed to deficiency of phosphates in the soil of Bihar. The use of superphosphate is necessary to prevent further deterioration.

The production of acetic acid from alcohol : by F. L. Usher and R. Venkateswaran.

Three methods were examined : (1) electrolytic oxidation, (2) oxidation by chromic acid, (3) oxidation by air.

Method (1) was useless, method (2) has certain advantages, method (3), involving the use of a catalyst, yields aldehyde, and the question of converting this into acetic acid is being investigated.

The influence of ammonium chloride, sodium chloride, and lithium chloride on the solubility of aniline in water : by B. H. Wilsdon, R. R. Khanna, D. R. Kapur, and H. D. Saneja.

The observed results, which are compared with those of Philip, are attributed to combination between aniline and the added salt. A similar assumption was made by Philip and Bramley.

The Oleo-Resins from Hardwickia Pinnata and Dipterocarpus Indicus : by J. J. Sudborough, K. Sitaram Iyer, and J. C. Mansukhani.

Distillation with steam yields in each case an essential oil and a resin ; the chief hydrocarbon constituent of both essential oils is β-caryophyllene. The resin from Hardwickia does not coagulate when heated ; that from Dipterocarpus does. Good oil varnishes have been made from both resins.

Note on the hydrolysis of certain Indian oils by castor lipase : by K. G. Latwala.

Cotton seed, ground nut, castor, and hongay oils are fairly readily hydrolysed at ordinary temperature by castor seed ferment. The seeds when germinated are less efficient than when resting.

Safflower oil as a drying oil : by H. H. Mann and N. V. Kanitkar.

Conditions of growth of the plant, and the physical and chemical constants of the oil are given ; and experiments on the effect of heat on the oil, under different conditions, and on its drying properties, are described. The work is being continued.

Chemical studies on safflower seed and its germination : by V. A. Tamhane.

The change of chemical content during germination has been studied, as well as the development of oxidase. The work is being continued.

Oxidases. With special reference to their presence and function in sugar cane : by R. Narain.

Oxidases, or oxidising enzymes, are present in different parts of the sugar cane plant ; and their function is to regulate the photosynthetic processes, and protect the cane from fungoid diseases. The acid of the cell sap furthers the growth of oxidases, and the plant can regulate this acid to its daily requirements. Heating oxidase extract does not destroy it, reducing agents temporarily suspend its activity. Starch potassium iodide is a valid reagent for oxidases ; cane sugar oxidases are not enzymic.

The investigation of a water-proofing solution used in the manufacture of surgical limb-baths and of other matters connected with the process : by H. B. Dunnicliff—undertaken on behalf of the Surgical Appliances Branch of the Indian Munitions Board.

Waterproofing solution is made from cotton wool dissolved in a cuprammonium solution prepared by precipitating a known amount of copper sulphate with sodium carbonate, washing the precipitate by decantation, and dissolving it in aqueous ammonia. The limb-baths are made from paper, starch paste, and this solution.

NEWS FROM THE SECTIONS.

CANADIAN PACIFIC.

On March 25 last, a meeting was held in the Council Room of the Board of Trade in Vancouver, Mr. J. A. Dawson being in the chair. Mr. A. Hallden read a paper on "By-products from Wood Waste and Wood Pulp Liquors."

After a short review of the development of the pulp and paper industry, Mr. Hallden described the manufacture of wood alcohol from the digester gases of sulphite and sulphate pulp mills. The methyl alcohol is condensed by cooling the gases, the condensate distilled, neutralised with lime, and then refined. The cost of the necessary equipment and the expenses of operation are very small. Cymene and furfural are very valuable products recovered from the gases. A colour industry based on the use of cymene has been started in Finland.

Mr. Hallden then referred to the sulphite waste liquors now allowed to flow into the streams and the sea. The waste liquor contains nearly half of the original wood used in cooking sulphite pulp. It may be used for road covering instead of tar, for making tanning extracts, for fuel, as raw material for alcohol and other purposes. Where coal, is scarce, pulp mills may supply their own fuel by recovering it from the waste liquor. They can also, if necessary, make their own lubricating oil from the resin.

The production of ethyl alcohol from the waste liquor is carried out in half a dozen pulp mills in Sweden and in one mill in the United States, the production in these mills being about three million gallons of 50 per cent. alcohol per year. The waste liquor containing the sugar is neutralised with slaked lime and limestone, the sludge allowed to settle, and the clear liquor fermented and distilled, giving a 91 per cent. alcohol before being purified. Another process involving the use of sulphuric acid, has been used in the United States but is more expensive.

From the sulphite pulp mills in British Columbia some 800,000 gallons of 100 per cent. alcohol could be recovered per year ; this now goes into the sea. Alcohol is now prohibited for beverage purposes but there is a large demand for it in the munitions industry and for other industrial purposes. To use grain for making alcohol to fill this demand, is a waste of food. Later there would be a market for alcohol in competition with gasoline for running motors, and for heating, instead of kerosene.

Chemical wood pulp is used not only for making paper but also for making clothing, sacks, twine, gun-cotton, aeroplane varnish, artificial leather and silk, and other purposes.

Much wood is wasted in logging and cutting the logs to lumber. Providing the market were found, charcoal could be made from part of this waste and at the same time chemical products from the tar and gases from the coke ovens could be recovered. Charcoal has been made on a small scale in British Columbia. A small quantity of potash can be recovered from the waste burners of sawmills which are using Douglas fir. Alcohol may

also be made directly from wood waste by heating with diluted sulphuric acid, fermenting and distilling the mash, using the cooked chips for fuel.

After the paper a discussion followed in which Prof. McIntosh expressed the opinion that the fermenting process for producing alcohol could be successfully worked in British Columbia, and that research on the subject might shortly be undertaken.

GLASGOW.

The annual report of this section states that during the past session six ordinary and two special meetings were held. It has been arranged that in future informal meetings should also be held, with the object of promoting sociability among the members, and that on these occasions matters of general interest should be discussed. During the past year the Section lost 15 members and gained 12, leaving the membership roll at 197, as compared with 200 a year ago. Mr. Quintin Moore has been elected chairman and Dr. C. H. Desch, vice-chairman. The new members of the Committee are Messrs. W. S. Herriot, R. T. Thomson, J. McWhirter, J. H. Young, and Mr. J. McLeod.

NEWCASTLE.

The last meeting of the session was held on April 24, with Prof. Louis in the chair. Dr. L. T. Dunn and Mr. O. Smalley were elected to the Committee, and a vote of thanks was accorded to the Council of the North East Coast Engineers for the use of their room.

Mr. O. Smalley read a paper on "The Constitution and Influence of a Cored Dendritic Structure in Alloys."

He said that this structure was met with in low carbon nickel steels, nickel chrome steels and in steels which had received improper treatment. Although various opinions prevail as to its significance, it is seldom regarded with disfavour, but when met with in non-ferrous metals and alloys, particularly in such which have no specific freezing point, it is indicative of poor physical properties. In such cases its presence can generally be correlated with non-homogeneity of the constituents. It can usually be removed by subsequent heat treatment to effect diffusion.

Mr. Smalley then exhibited lantern slides showing the micro-structure, and tables giving the tensile and other physical tests of Admiralty gun-metal, phosphor bronze and brass. He concluded that (1) the presence of a cored dendritic structure is embrittling in its influence on phosphor bronze; (2) the correct casting temperature depends upon the size and shape of the casting to be made and for general purposes lies between 1100—1075° C.

In the case of Admiralty gun-metal, the best results are obtained in casting in chill moulds at a temperature of 1100—1170° C., and in sand moulds at 1125—1200° C. It is very important that this alloy should be free from the dendritic structure. Although such a structure is of little moment in "alpha" brasses, it is distinctly embrittling; its formation is favoured by soluble and prevented by insoluble impurities.

He referred with some reserve to aluminium alloys and said that our knowledge of these alloys was far from complete, but instanced one case where a cored dendritic structure was responsible for the result of the tensile tests dropping to one-half the original value.

The presence of the structure in steel was of paramount importance, and is intimately connected with the presence of "ghosts," which are always found in steels made by an oxidising process. They may exist in the absence of solid foreign matter although the converse does not hold. "Ghosts" are an effect of soluble impurities, and are unaffected by any kind of heat treatment—normal or abnormal.

The paper gave rise to a long discussion in which the chairman and Messrs. Dunford Smith, A. Short and Gratton took part.

LIVERPOOL.

During the past session seven meetings of the Section have been held at which the attendance was somewhat better than in recent years. At the seventh (and annual) meeting held on April 26, Mr. Edwin Thompson and Dr. A. Holt were re-elected Hon. Treasurer and Hon. Secretary respectively, and the vacancies in the Committee caused by the retirement of Messrs. A. Carey, P. de G. Coghill, E. L. Peck and G. Carruthers Thompson, were filled by the election of Messrs. C. J. T. Cronshaw, A. H. Salway, J. Twomey and J. H. Wigner. It is satisfactory to be able to record that the membership of the Section has increased considerably during the past session.

MANCHESTER.

The last meeting of the Session was held on May 3, when Mr. J. Drummond Paton opened a discussion on "The Production of Smokeless Fuel, Oil and Gas."

Although the best of the Lancashire house coal was now exhausted there still remained coal which was high in resinic value and from which it was hoped a market would be created in paraffin and petrol. Coal in its natural state should never be consumed as fuel but scientifically dealt with in order to conserve its valuable elements. There was a very wasteful system of coal mining in this country. In the Königin Luise Mine there was as much coal got from a 200 yards face as there was from a mile face in some of the British mines. The mining engineer of the future would also have to be a chemist. He advocated the creation of a "Central Coal Using Authority," of a type somewhat analogous to that in Germany, every important industry or undertaking being represented upon its Board of Management, and Sectional Boards being affiliated. By this means all the coals of the country could be allocated to the purposes for which they were most suitable, and their bye-products preserved. Prompt measures should be taken to utilise the so-called "waste" coal left in mines.

LONDON.

At the annual meeting of the London Section, held on May 6, the ballot was taken for new members of the Committee, with the result that the following were elected:—Messrs. Baker, Berry, Brown, Goodwin, Morson, Philip and Scard. The Chairman, Dr. Charles A. Keane, referred to the loss which the Section and the Society had sustained through the death of Mr. A. Gordon Salamon, who had not only filled the office of chairman of the Section during the Session 1904-6, but also rendered great assistance to the Society in many other ways. His wide acquaintance with chemical technology, his rapid and clear grasp of problems were always useful assets to any committee on which he served.

The first paper, by Dr. Seligman and Mr. Williams, contributed to our further knowledge of the chemical activities of aluminium, a subject which the authors have already done much to elucidate. In a previous paper, they had suggested that up to butyric in the fatty acid series,

the presence of even a small quantity of water is sufficient to inhibit the action of these acids on aluminium, and the experiments detailed in this paper confirm this view in the case of higher members of the series. As an instance it may be mentioned that pure and mixed palmitic acid and oleic acids are without effect on aluminium at 300°C., though they attack it at lower temperatures at which some trace of water may be retained. From time to time, cases have occurred in which aluminium has been attacked during the distillation of phenols and cresols, and the suggestion has been made that there was a critical temperature at which reaction took place, but the author's experiments show that immunity from attack is due to the presence of water, and they also find that di- and tri-hydroxy compounds are without action. Similarly, alcohols attack aluminium vigorously when absolutely dry but not when they contain even traces of water. It is not easy to frame a hypothesis to account for all these phenomena, but a tentative suggestion is that small quantities of water in the acids may give rise to the formation of a gelatinous, basic coating which is protective, or that the rate of dissolution in the acids is high and a protective oxide is formed.

In the second paper, Mr. J. S. G. Thomas gave the results of his experience of hot wire anemometry. The method is based on the fact that when a hot wire is exposed to the passage of a stream of gas, a lowering of the temperature of the wire occurs which can be used as a measure of the amount of gas passing. One objection to the method has always been that a platinum wire, heated electrically to say 200° C., is liable to attack in many gases. This, however, has been overcome by an ingenious device of the author's which at first sight would hardly have given much promise of success; but he has demonstrated that the wire can be completely coated with glass and so preserved from the action of gases without impairing the sensitiveness of the apparatus. A very interesting application was described of hot wire anemometry to the measurement of gas and air supplied to an incandescent burner, and the changes in their relative proportions before the flame settles down to a steady condition. Probably no other method could have given the same information. In the discussion, some diversity of opinion was expressed as to the relative merits of the hot wire and Pitot tube methods, but on the whole the balance of opinion was in favour of the former.

CHEMICAL INDUSTRY CLUB.

(London.)

The first annual meeting of this Club was held at the Abercorn Rooms, Liverpool Street, E.C., on May 13. There was a large attendance, and Dr. C. A. Keane was in the chair.

The following three resolutions were placed *en bloc* by Dr. W. R. Ormandy and seconded by Mr. S. J. Tungay:—

(1) That the Club shall not limit its membership to members of the Society of Chemical Industry.

(2) That the subscription be increased with a view to the Club having a permanent home.

(3) That the elective principle be introduced as regards future admission to membership.

A further resolution was proposed by the Hon. Secretary, Mr. H. E. Coley, and seconded by Mr. Clark:—

"That this meeting is of the opinion that arrangements should be immediately made by the Committee for enlarging the scope of the Club by hiring or otherwise securing premises suitable for a social and residential Club, to open every day, with the usual facilities and terms of membership of such an organisation; and recommends that as some members may not need such a Club though still desiring to meet members periodically, the usual monthly meetings of the Club be continued, and members who wish to attend such meetings only should be able to do so by payment of a smaller subscription calculated approximately to cover their cost; and further recommends that if the various Societies now in existence in connexion with chemistry or chemical industry should wish to form a similar Club or to be housed in one building of a national character no obstruction should be placed by this Club in the way of a merging of interests on an equitable basis; and further recommends that all the various societies now in existence in connexion with chemistry or representative of chemical industry should be immediately invited to co-operate with a view to securing for the Club the most influential support possible and its ultimate housing in a building of a national character at an early date."

The discussion which took place showed quite clearly that there is a strong feeling that the time has come for the broadening of the basis of the Club, and it is hoped that when a scheme is drawn up by the Committee and submitted to interested people the effort will be productive of good results.

All the resolutions were passed, practically unanimously.

The following elections were then made:—

Hon. Secretary, Mr. H. E. Coley (6, Bury Court, St. Mary Axe, E.C.3.) Hon. Treasurer, Capt. C. J. Goodwin. Hon. Auditor, Capt. L. M. Nash. Committee: Messrs. J. W. Hinchley, H. V. A. Briscoe, E. C. B. Wilbraham, E. T. Brewis, C. J. Goodwin, F. B. Dehn, L. J. de Whalley.

MEETINGS OF OTHER SOCIETIES.

LA SOCIÉTÉ DE CHIMIE INDUSTRIELLE.

The last monthly meeting was held on April 29 in the Hotel du "Comité des Forges," Paris, under the chairmanship of the President, M. Kestner, who, in an introductory speech, communicated the results achieved since the foundation of the Society exactly twelve months ago, and read a letter from Prof. H. Louis congratulating the Society on its efforts, and assuring it of the hearty co-operation of the Society of Chemical Industry.

M. Granger, Professor of Ceramics at the national factory at Sèvres, then read a paper on "Stoneware in Chemical Industry." After having sketched the position of the industry at the outbreak of war when France was dependent on Germany, not only for certain "key" materials but also for a large number of manufactured products, M. Granger gave an account of the materials used in the manufacture of chemical stoneware, all of which were to be found in France. He then explained the various phases of the manufacture of such articles as carboys, worm condensers and vats, and described the different types of furnace used in their production. He concluded by describing the various tests which satisfactory ware must pass, and in particular those relating to resistance to heat and to pressure.

M. Matignon followed with an address on the classification of industries, and on the question of improving production in the heavy chemical trade. He remarked on the current tendency to group cognate industries under central associations, which undertake the distribution of raw materials

and negotiate directly with the State on matters concerning production and the fixing of selling prices. This tendency could be used advantageously to further a systematic study of the economics of raw materials, increased production and the lowering of net costs. The author proceeded to describe the system in use in the British Ministry of Munitions, under which the most complete returns from the factories are tabulated, charted and averaged every week. The officials and the works' managers hold regular monthly meetings, at which questions of cost, discrepancies, etc., are fully discussed. This centralised system has already succeeded in augmenting production, and in diminishing waste of raw materials. The system is being extended by sending the collective data to the colonies where investigations are held concerning proved discrepancies in the prices of the raw materials exported from each country. Such a system should prove to be of great value in the economic "war after the war," and also tend to reduce the cost of living. It could be adopted profitably in France.

ROYAL SOCIETY OF ARTS.

A paper, entitled "Sugar from Several Points of View," was read on May 1 by Mr. George Martineau, with the object of proving that:—(A) Nascent industries can be encouraged, and efficiency created, by a rational but moderate stimulus; (B) preferential treatment in home markets is the best, perhaps the only, way to give confidence to capital; and (C) dumping of commodities below cost price is an injury to the consumer.

The effect of a stimulus was illustrated by the rapid progress in beet sugar production, from about 250,000 tons in 1856 to over 8,000,000 tons in 1913. Progress was most rapid in Germany, and was due to persistent scientific research prompted by a suitable stimulus, namely, the sugar duty being levied—not on the sugar produced, but on the roots entering the factory. Farmers were thereby stimulated to produce roots containing the maximum percentage of sugar; and, by scientific plant-breeding, the percentage was raised from about 6 to from 16—18%. Again, manufacturers were stimulated to extract the largest possible quantity of sugar from the roots, which led up to the discovery of the diffusion process, which extracts 98% of the total. Research in other directions resulted in greatly improving the quality of the manufactured sugar, and reducing the cost of manufacture.

Another example of stimulus was taken from the cane sugar industry. In 1898, Cuban sugar received preferential treatment in American markets to the extent of a little more than half a farthing per pound—quite inappreciable to the consumer. The effect was to increase the Cuban production from one million tons in 1903, before the preference was given, to three million tons in recent years. The small preference was sufficient to give security to capitalists, and resulted in the erection of large factories and railway connexions to shipping ports. One of these factories has an output of over 100,000 tons per annum. The good effect of American preferential treatment is by no means restricted to Cuba. In Louisiana, the production has increased from 95,000 to 414,000 tons; in Hawaii (Sandwich Islands) from 12,000 to 602,000 tons; in Porto Rico from 50,000 to 400,000 tons; in the Phillipine Islands from 92,000 to 300,000 tons; and in the American beet sugar industry from 1000 to 779,000 tons.

The third claim, that the dumping of sugar below cost price is an injury to the consumer, was also deduced from the history of sugar production during the past forty years. In the first place, dumping is followed by reduced production and higher prices; secondly, the country which dumps its surplus sugar is aiming at complete monopoly and ultimate control of prices; and, thirdly, the consumer of dumped sugar becomes more and more dependent on his supply from a particular country, and therefore suffers periodically when the supply is reduced owing to shortage of the crop or other causes. These are conclusive answers to a distinguished economist who recently proclaimed that "the millions should not be deprived of cheap sugar, even if it be dumped."

In conclusion, Mr. Martineau referred to the opposite point of view, namely, the injury done to our own sugar producers by competitors armed with an artificial stimulus. This aspect has been very fully dealt with in his book—"A Short History of Sugar, 1856—1916, a Warning"—to which he referred his audience.

The Cobb lectures were delivered by Prof. H. R. Procter on May 13 and 14, the subject being "Recent Developments in Leather Chemistry."

After briefly sketching the anatomical structure of skin, the lecturer described the preliminary processes required to fit the hide for tanning. Of these, removal of the hair and epidermis structures is the most important, and the processes in commercial use are dependent either on the solvent action of alkalis, and especially of alkaline sulphides, on the epidermis tissues, or on the effect of digestive ferments either produced by bacteria or obtained directly from animals, the pancreatic ferment being in commercial use.

He then described and explained the chemical principles involved in the removal of lime and the reduction of swelling which is necessary for the production of the softer leathers, and emphasised the importance of under swelling and its converse "falling" in the processes of leather manufacture. Among the acids used for deliming, boric, lactic, and sulphuric acids were especially mentioned. Of these, lactic acid is now very difficult to obtain, being a food product, and sulphuric acid is much the cheapest. At pre-war prices, 0·8d. of sulphuric acid will do the same work as 1s. 6d. of lactic acid. The attention of tanners was directed to the use of formic acid, which is now being made in large quantities in the north of England.

The swelling caused by acids and alkalis is due to the osmotic pressure of the ions of acid or alkaline colloid salts, which cannot leave the jelly because of the attraction of the colloid gelatine, and must therefore expand it by drawing in the outer solution. This swelling force was diminished though never entirely balanced by the osmotic pressures of the outer solution, and when these were increased by the addition of acid or of salt the swelling was diminished to any required extent. The other force which opposes swelling is the cohesive attraction of the skin itself, and if this be lessened by heat the swelling increases and may go on to complete solution. Differences in the concentrations of the ions caused surface electric charges on the hide-fibres which are of great importance in the actual tannage.

In the second lecture, Prof. Procter explained that the tanning of the skin was due to electrochemical affinities between the skin-fibres and the tanning substances, to the dehydration of the fibres by osmotic causes which prevented their subsequent adhesion, and to the deposition of solid substances on and between them by adsorption.

He mentioned that Prof. Knapp in 1852 had produced a sort of leather by mere dehydration with strong alcohol, and that he had also invented

a chrome tanning process quite similar to that now in use, but had failed to understand its value.

The lecturer then proceeded to describe a number of methods of producing leather with chrome and alumina salts, oils, formaldehyde, quinones, etc., and explained their relations to the principles he had advanced in his previous lecture.

In connexion with chrome tannage he referred to the scarcity of sodium sulphite and thiosulphate, and to the inability to use glucose as a reducing agent; he therefore suggested that sulphur dioxide be used instead of the last named. If this gas be passed into a solution of sodium bichromate containing 4 lb. to the gallon, a chrome extract containing 18·5 per cent. of chromic oxide resulted which was stronger than any on the market, and was particularly suitable for making sole leather. The hide swelled adequately and the tannage was finished in about 24 hours. His experiments were not yet complete, but they promised well.

ROYAL INSTITUTION.

Prof. F. Gowland Hopkins, of Cambridge University, gave the Friday Evening Discourse on May 10, on "The Scientific Study of Nutrition."

The statistical method employed in the study of nutrition deals mainly with the habits of peoples, but the experimental-scientific study has to take into consideration the question of their physiological needs.

The calorimetric method of determining food values is based on the assumption that the heat evolved in the combustion of an edible substance outside the body is equivalent to its heat value when consumed within the body. The lecturer explained the method of finding the external heat value of a substance by means of the bomb calorimeter, and then proceeded to describe how the heat set free from a living being is determined by confining him in an air-tight chamber fitted up as a large calorimeter containing water circulating between the walls, and means for registering and equalising temperatures, etc. Accurate human calorimetry is, he said, "a triumph of American science." In the respiratory calorimeter of Atwater-Rosa-Benedict, the amount of oxygen supplied to the patient is accurately measured. Respired carbon dioxide is found by absorption in soda lime, and the ratio, carbon dioxide evolved : oxygen consumed (called the "respiratory quotient") is calculated. On the assumption that during their physiological oxidation foodstuffs yield a quantity of heat equal to their ordinary heats of combustion, a knowledge of the nitrogen excreted, the oxygen consumed, and the respiratory quotient, permits of an indirect calculation of the energy liberated by the body. The values found indirectly in this way agree so closely with those found by the direct calorimetric method that the above assumption is shown to be fully justified.

The amount of heat evolved when a person is absolutely quiescent (called the "basal metabolism") amounts to one Calorie per kilo. of body weight per hour, or, for an average person, 1600 Cals. per 24 hours. The effect of the luxurious movements of life, for example, making gestures, fidgeting, etc., is to increase the basal metabolism by 25—30 per cent.; and a person who leads a sedentary life evolves about 2500 cals. per 24 hours. The accurate experiments of Benedict and Cathcart have shown that for every extra calorie of work done the cost in food energy is 3·343 cals., *i.e.*, the efficiency of the body regarded as a machine is 29·7 per cent., as compared with 12—13 per cent. in the case of a steam engine.

Accurate and important as the calorimetric methods undoubtedly are, they cannot answer all the questions which need solving at the present time, *e.g.*, What is the least quantity of food that can be consumed without impairing the mechanical efficiency of the body, or affecting detrimentally health or output in the form of work? To reduce one's body weight, and the metabolism to the basal line, seems advantageous at the present time, but this also involves diminished vitality, which is not a good thing.

In 1917 some scientific experiments were performed at Munich on medical students. At the time, the daily ration of the inhabitants was equivalent to 1600 Cals., corresponding to a loss in body weight of about 15 per cent. It was found that the students were able to continue their ordinary work with unimpaired efficiency when their basal metabolism was lowered to 1400 Cals.; but after taking unusual exercise in the form of a long walk, their tissues were found to be in a pathological condition.

Calorimetric measurements do not suffice to determine completely the nature and quality of the ration to be supplied. The nature of the protein to be ingested must also be considered, for some forms of it correspond more nearly than others to the direct needs of the body owing to a varying balance in the amino acids present. One of these acids, the presence of which is essential to health, is tryptophane, and a food stuff like maize, which gives rise to but very little of this product, can be much improved dietetically by the addition of *e.g.* casein.

After alluding to the very important part played by accessory factors in human dietary, and suggesting that their beneficent action was probably one of stimulation, the lecturer concluded by stating that one of the most important problems yet to be solved is that of determining the range of adaptability of the human body.

OFFICIAL NOTICES OF THE SOCIETY.

ANNUAL GENERAL MEETING, 1918.

In accordance with the provisions of By-Law 64, notice is hereby given that the Annual General Meeting will be held in the University Buildings, Bristol, on Wednesday, July 17, 1918, at 11 a.m. (not 10.30 as previously intimated). A programme of the proceedings will be inserted in the next issue.

In accordance with the provisions of By-Law 24, those members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Professor Henry Louis has been nominated to the office of President under By-Law 20; Dr. E. F. Armstrong, Professor W. R. Hodgkinson, Mr. R. L. Mond, and Mr. W. F. Reid have been nominated Vice-Presidents under By-Law 21; and Mr. D. Lloyd Howard and Dr. R. Messel, F.R.S., have been re-appointed Hon. Treasurer and Hon. Foreign Secretary respectively.

Mr. W. J. A. Butterfield, Mr. H. Edwin Coley, Mr. C. S. Garland, Sir Robert A. Hadfield, Bart., F.R.S., Dr. F. Mollwo Perkin, and Mr. Ernest Walls have been nominated under By-Law 25 to fill 4 vacancies among the Ordinary Members of Council. A ballot list will be found in the next issue of the Journal.

In accordance with the provisions of By-Law 72 notice is hereby given that the Council has awarded the Society's Medal to Sir James Dewar, F.R.S., in recognition of the conspicuous services which by his research work in both pure and applied science he has rendered to chemical industry.

J. P. Longstaff,
Secretary.

OFFICIAL NOTICES OF THE SOCIETY.

(Continued.)

SPECIAL NOTICE TO MEMBERS PROPOSING TO ATTEND ANNUAL GENERAL MEETING.

The Committee of the Bristol and South Wales Section requests that, owing to the present abnormal conditions, all members who require accommodation in Bristol at the time of the meeting, should at once communicate their requirements to the Hon. Local Secretary, R. F. Easton, Stafford House, Nailsea, nr. Bristol.

PROGRESS OF THE MEMBERSHIP.

The Council considers that the subjoined table will be of interest to the members, as indicating the progress of the Society.

It will be observed that for the period 1911 to 1914 there was a falling off in the membership, attaining a maximum of 144 in the latter year. From 1915 to 1917, inclusive, there has, however, been an annual increase, amounting in 1917 to 406.

It is gratifying to note that, while the number of new members is steadily increasing, there is a notable decrease both in the "deletions" owing to non-payment of the annual subscription, and in the resignations. With regard to the deaths, the numbers, which include those killed in action, must be regarded as very moderate, considering that many of the members are on active service.

	1911.	1912.	1913.	1914.	1915.	1916.	1917.
Elections	217	254	202	182	352	469	612
Resignations	85	106	102	121	74	32	65
Deletions ..	142	135	145	159	200	93	89
Deaths	36	44	27	46	67	61	52
Losses	263	285	274	326	341	186	206
Net gain or loss	−46	−31	−72	−144	+11	+283	+406

The numbers given under any particular year are those for the 12 months ending March 31 of that year.

MONOGRAPH ON "THE CONSTITUTION OF COAL" BY DR. MARIE STOPES AND DR. R. V. WHEELER.

In January, 1917, papers were read before the London Section of the Society by Dr. Marie Stopes on "The Palæobotany of Coal" and by Dr. R. V. Wheeler on "The Constitution of Coal." As these papers contain records of work of first-class importance, and the subjects dealt with are of the highest value from both the scientific and economic standpoints, the authors, on the suggestion of the Committee of the Section, jointly undertook amplification of the papers with the result that a monograph on the whole subject has been prepared.

The Council of the Society, considering the publication of this monograph to be a matter of national importance, approached the Department of Scientific and Industrial Research, with the result that the monograph has been printed and published by H.M. Stationery Office.

A copy will be sent to each member of the Society along with an early number of the Journal.

THE PROFESSION OF CHEMISTRY.

BRITISH ASSOCIATION OF CHEMISTS.

The third report of the Executive Committee of the Association states that it has held nine meetings and has been in constant conference with the Council of the Institute of Chemistry. The two bodies have produced a satisfactory scheme (this J., 1918, 175 R), which incorporates the aims of the Association. It has been agreed that the Associateship of the Institute should be the recognised qualification for a chemist.

In order to include as many chemists as possible who have taken other examinations and courses of training than those formally necessary for admission to the Institute, the members of the Institute have decided to modify their regulations. These modifications are not necessarily final, and as the Council of the Institute has expressed its intention of reviewing them annually, bodies of chemists whose qualifications are not covered by the new regulations will be given full consideration in the future. In the meantime a considerable advance has been made. The Executive is fully convinced that not only has the Institute the real and vital interests of all chemists at heart, but that there exists within the Institute a thoroughly satisfactory constructive policy, such as is demanded by the exigencies of the times for the professional organisation of chemists.

A series of meetings of local sections of the Association is now being held throughout the country to discuss the two following resolutions:—

(1) "That this meeting considers that the proposals of the Institute of Chemistry, ratified by the Institute's Extraordinary General Meeting on April 27, 1918, reasonably meet the demands of the British Association of Chemists' Inaugural Meeting in Manchester on November 10, 1917."

(2) "That this meeting is of opinion that in view of Resolution (1) above, and because the Executive considers that the mandate of the British Association of Chemists, Inaugural Meeting, in Manchester, on Nov. 10, 1917, has been substantially carried out, the British Association of Chemists shall therefore cease to exist as soon as convenient after Local Sections of the Institute of Chemistry have been established."

The Executive has decided to take a vote throughout the country on these resolution, such voting to be confined to members of the B.A.C., and to chemists possessing the (A) or (B) qualifications* for membership. The final decision of the Executive will rest on the voting of chemists throughout the country.

The result of the ballot will be announced at the National General Meeting to be held at the College of Technology, Manchester, on June 15, at 2.30 p.m.

LONDON.

A meeting to consider the arrangements come to with the Institute of Chemistry, and the future of the B.A.C., was held at the Society of Arts on May 13. Professor J. W. Hinchley, chairman of the London Section, presided. The Executive submitted the two resolutions above-mentioned.

Dr. Hedley (Nottingham) and Mr. E. W. Smith (Birmingham) represented the Executive Council, and spoke in support. Dr. Hedley said that there were other things which required attention in the interests of the profession than those accomplished. It was derogatory for chemists to have

A. Any person holding a University Degree (or its equivalent) with Chemistry as principal subject.

B. Any person who can show evidence satisfactory to the Council of having had a sufficient general education and of having practised pure or applied chemistry for not less than seven years, and who now holds a responsible position.

to apply through Labour Exchanges for positions, and for their advertisements for appointments to be described in the trade journals as "situations wanted," etc. He strongly advocated the need for "Chemical Supplements" to newspapers, on the lines of Engineering and similar supplements, so that the public might be educated to the work of the chemist. Mr. Smith spoke of the gratifying manner in which the President, Past President, and other members of the Council of the Institute met and discussed the questions, and paid a high tribute to the enthusiastic and broad minded support which they had given to all proposals for the better organisation of the profession.

With regard to the future of the B.A.C., Mr. Smith pointed out that it would either have to go on in the interests of those possessing its qualifications for membership, which could equally well be the function of the Institute, or it would have to cater for the interests of "all those engaged in carrying out chemical operations." If the voting went in favour of carrying on, the local sections would have to state specifically the nature of the objects desired, and any change of policy would almost certainly mean an entire change of *régime*.

Mr. F. H. Lees and Mr. Nevill Huntly supported. Mr. C. S. Garland contended that the principal objects had not been carried out by the passing of "pious resolutions," that they should be carried out, and that certain of the original objects had been abandoned.

Sir Robert Robertson said that the Council of the Institute was considering similar proposals twelve months ago, before the B.A.C. was inaugurated, and that its policy then was practically its policy to-day. In all essential points this covered the proposals of the B.A.C. If the Institute had not become the sole registration authority for chemists it was because qualified men had not joined, but under the extended conditions of admission there was no reason why every qualified man should not join.

Speaking to a resolution submitted by the Committee of the London Section "that the B.A.C. should continue to exist to look after the interests of all who earn their living in the vocation of chemistry," Mr. Garland contended that there were many economic questions which the Institute could not deal with, such as wages and times of employment. There was a desire on the part of the Government for workers to combine. Under the Whitley Report there would be conference work at which a body like the B.A.C. should be represented to look after the workers' interests. Mr. Gardner supported.

Mr. Smith pointed out that all present workers in local sections of the B.A.C. would find opportunity for continued activity in the local sections to be established by the Institute, and that only an association of fully qualified men would be sufficiently influential to improve the educational and other prospects of the unqualified younger chemists so as to give them a better chance of obtaining proper qualifications.

The resolution of the London Committee was declared carried.

HUDDERSFIELD.

On May 16 a meeting of local chemists was held at the Huddersfield Technical College, under the presidency of Dr. A. E. Everest, to discuss and ballot upon the new proposals of the Institute of Chemistry.

After Mr. H. Royal-Dawson, the local secretary, had reported upon the proceedings of the local committee since its formation, Mr. H. Houseley proposed that a ballot be taken on the two resolutions submitted. He said that the proposals of the Institute fairly well carried out the ideas of the promoters of the B.A.C., and that the interests of chemists would be better served by union in one body. He also reminded the meeting that on April 27, Sir Herbert Jackson intimated that the regulations of the Institute as to the admission of candidates would still be open to revision from time to time, and that due consideration would be given to any suggestions that might be offered by its local sections.

Mr. L. Mills seconded the motion. He considered that the Institute's definition of a qualified chemist (in the case of the non-degree man) was better than that of the B.A.C. Executive, and that the Council of the Institute had shown itself willing to stretch the provisions of the charter to the utmost. Nor did he think that anything could be achieved by the continuance of local sections of the B.A.C. which could not equally well be achieved through local sections of the Institute.

Discussion followed, from which it appeared that there were differences of view (1) as to how far the Institute proposals could be held to satisfy the original requirements of the B.A.C.—as to the question of a sole registration authority, and as to a legal definition of the term "chemist"; and (2) as to whether it would not be a wise policy in any event for the B.A.C. to be kept in existence until more or all of its general objects had been specifically met. On the other hand it was urged by Mr. J. Schofield that there are too many societies and sections concerned with chemistry already, and by Mr. Hall that the acceptance of the Institute proposals would give B.A.C. men a powerful, if not actually a dominating, influence in the counsels of the Institute in future. An appeal was also informally made to the meeting by Dr. L. G. Paul, whose view was that generous concessions had been made by the Institute, and that secondary matters might well be left for settlement hereafter. The setting up of a separate organisation would, he thought, endanger the development of the profession; and if a new association should go to Parliament for a charter it would be very difficult indeed for Parliament to decide in view of the fact that one chartered body was already in existence. Mr. Houseley then briefly replied on the discussion (pointing out, amongst other considerations, that the charter of the Insititute empowers it to act as sole registration authority), and the resolution to take a ballot was put and carried.

The results of the ballot were declared as follows: For the acceptance of the proposals of the Institute of Chemistry, 61; against, 6. In favour of the continuance of the B.A.C. after local sections of the Institute have been formed, 15; against, 52.

TEXTILE CHEMISTS AND THE B.A.C.

At a meeting held in Manchester on May 10, Mr. W. E. Kay presiding, the following resolution was adopted unanimously:—

> "That whilst this meeting of the textile chemists of the North of England and the Midlands, convened by public advertisement, would have preferred that the B.A.C. should have carried out its original purposes independently of the Institute, it recognises the efforts of the latter body to meet the B.A.C. requirements but nevertheless strongly urges the Provisional Committee to proceed with the definite formation of the British Association of Chemists."

A Standing Committee of 16 members was appointed to hold a watching brief in the interests of chemists in the textile and allied trades. The Committee includes chemists engaged in the manufacturing, bleaching, dyeing, printing and finishing of cotton and woollen goods and in the paper, carpet and asbestos industries, with Mr. N. G. McCulloch, of the Rhodes Print Works, Manchester, as Hon. Secretary.

NEWS AND NOTES.

UNITED STATES.

New Source of Toluene.—Additional research with a view to the production of toluene from spruce turpentine is progressing, according to a paper published in the Journal of Industrial and Engineering Chemistry. Spruce turpentine, so-called, is a waste product of the sulphite process of making sprucewood paper pulp, and it consists largely of one aromatic hydrocarbon, viz., cymene. Professor A. S. Wheeler, of the University of North Carolina, reports favourably on the experiments of the French chemists, Boedker and Halse, although he was unable to reach the yields that they announced with the material at hand. Work is still in progress. The spruce turpentine (*i.e.*, cymene), subjected to the combined action of benzene and aluminium chloride yields toluene and cumene. The latter is not a waste product since it may be oxidised directly to benzoic acid, and will save a like amount of toluene now used for this purpose. The total amount of toluene obtainable from this source is not great. (Cp. this J., 1918, 153 R.)

Effect of Grease on Electrolytic Pickling.—Dr. C. Hering, of Philadelphia, reports that as a result of many tests he concludes that oil or grease, no matter how thickly coated upon a steel plate, does not interfere in the least with electrolytic pickling. He applied mineral oil, soft tallow, lard oil and linseed oil to the surface of sheet steel in different places while parts of the sheet were left free, and he then proceeded with electrolytic pickling in the regular way by the Reed process. He found that the scale was removed just as fast and just as completely from those parts which had been covered with oil or grease as from those parts which had not.

A New Method of Illuminating a Microscopic Field.—Prof. Alex. Silverman, of the University of Pittsburgh, has invented and applied for patents on a new device for microscope illumination. It consists of a tube, bent into the form of a circle so that the ends nearly meet, and containing a tungsten filament. It may be made of colourless or blue (daylight) glass, with a white reflector on the upper portion, and it is clasped to the microscope objective. The models in use require 0·7 ampère and 6 volts. It has the advantage that it travels with the microscope tube and is always in position. It also shows details not visible when vertical illuminators are used. The remarkable definition of the image obtained by the new process should result in important developments in the field of metallography. Inasmuch as the light surrounds the objective it causes less eye-strain than vertical illumination.

Chemical Problems awaiting Solution.—In an address lately delivered before the Pittsburgh section of the American Chemical Society, Dr. S. R. Scholes, of Rochester, New York, proposed the following problems as challenging the attention of the chemist: To make steel in large quantities not only cheap but resistant to rust, vibration and other destructive forces; to protect wood from the attacks of air, moisture, insects and fungi; to make glues and cements that will last as long as the substances that they bind together; to make dyes that will not fade and paints and varnishes that will retain their colour and protective power; to develop rubber so that its useful life is years instead of months; to improve clay products, mortars and Portland cement until they become indifferent to heat, cold, dryness and moisture; to discover new treatments for textile fabrics that will increase their strength and resistance to wear and the agencies of decay and even to fire itself, while preserving their useful characteristics; to improve paper so that the printed page will have a real lasting quality, and to take from glass some of its fragility.

The Chemists' Club.—At the annual meeting of The Chemists' Club of New York, held on May 1, the following officers were elected: President, Mr. Ellwood Hendrick; Resident Vice-President, Dr. Charles H. Herty; Non-resident Vice-President, Dr. Charles L. Parsons; Secretary, Mr. J. R. MacP. Klotz; Treasurer, Mr. Henry M. Toch; Trustees to serve for three years, Messrs. T. R. Duggan and K. G. McKenzie.

The new President is author of "Everyman's Chemistry," consulting editor of Metallurgical and Chemical Engineering, and is associated with the research laboratory of Messrs. Arthur D. Little, Inc., of Cambridge, Mass., as editor of "The Little Journal." Dr. Herty is ex-president of the American Chemical Society and is editor of its Journal of Industrial and Engineering Chemistry. Dr. Parsons is secretary of the American Chemical Society and is chief chemist to the United States Bureau of Mines.

The officers and trustees presented the retiring president, Dr. M. C. Whitaker, with a silver service in appreciation of his singularly able and efficient direction of the Club's affairs during the past three years.

GENERAL.

Gift for Agricultural Research.—Mr. W. B. Randall, of Waltham Cross, has generously provided funds for the establishment of a new research post at the Rothamsted Experimental Station, to which the Committee has appointed Mrs. D. J. Matthews, formerly Miss A. Isgrove. Mrs. Matthews is an Honours graduate of the Victoria University of Manchester, where she gained the Platt and the Dalton Biological Scholarships; she afterwards carried out important investigations at the Marine Biological Station, Plymouth. Her work at Rothamsted will be the study of some of the problems connected with soil sterilisation.

The Textile Institute.—At the annual meeting of the Textile Institute held in Manchester on May 2 and 3, Sir Frank Warner was elected president in succession to Sir William Mather, who held the position during the three previous years. It was announced at the meeting that Sir William Mather had offered to give £1000 towards a fund of £50,000 for developing the work of the Institute. The Journal of the Textile Institute is now issued monthly and includes abstracts of textile literature and patents.

Gypsum and Allied Deposits in Great Britain.—The second edition of Vol. III. of the Special Reports on the Mineral Resources of Great Britain has just been published by the Geological Survey. (Price 2s. net.) It deals with gypsum, anhydrite, celestine and strontianite. The various sources of these minerals are noted, and the methods of treating and using them are briefly described.

Gypsum is chiefly found in rocks belonging to the Permian, Triassic and Jurassic Systems, the most important locations being Cumwhinton, Cotehill and Whitehaven in Cumberland; Chellaston in Derbyshire; Yate in Gloucestershire; Thurmaston and Gypsy Lane in Leicestershire; Newark, Balderton, Orston, Cropwell Bishop, East Leake, Gotham, Barton, Thrumpton and Kingston in Nottinghamshire; Watchet in Somerset; Hanbury and Draycott in Staffordshire; Mountfield in Sussex; Kirkby Thore and Temple Sowerby in Westmor land; and South Millford in Yorkshire.

The output of gypsum was very steady for the years 1903 to 1916 with an average of about

250,000 tons per annum and a mean value of £85,000. Finely powdered gypsum, or "mineral white" is chiefly used in the paper trade, particularly when, as now, the supply of kaolin is limited.

Unworked reserves of gypsum will probably be found east of the Vale of Eden (Cumberland), south of Culgarth (Westmoreland), near Rectory Farm, Aston-on-Trent (Derbyshire), Gipsy Lane Brick Works and Crown Hills near Evington (Leicestershire), between Hawton and Cotgrave and in the Gotham district (Notts.), Sudbury (Staffs.), and in a triangular area of 100 square miles embraced between Penshurst, Ashdown and Battle (Sussex and Kent). It is doubtful whether the reserves at the base of the Keuper sandstone in Yorkshire could be worked at a profit on account of flooding.

Celestine is found chiefly in Gloucestershire and Somerset. It is worked in the Yate district and places between there and Bitton, at Charfield, north of Wickwar Tunnel and south-west of Milbury Heath (Glos.), and at Regilbury Court and Abbots Leigh (Somerset). A little celestine is also found at Forest Moor near Knaresborough (Yorks.).

Strontianite is nowhere worked in England and Wales, but its occurrence in Green Laws, Lead Mine, St. John's Chapel, Weardale (Durham) and in the waste heaps at the mouth of Victoria Level, Swaledale (Yorks.). are of interest. The former deposit consists of a vein of almost pure strontianite; the Swaledale "water-spar" is a mixture of witherite and strontianite.

The price of celestine at Yate in 1915 was 10s. per ton; to this must be added 3s. to 4s. 6d. for transport to Bristol docks. Since 1915, the price has risen considerably. In normal times, the price is controlled by the extensive deposits in Sicily which ordinarily do not pay for transport on mules to the coast, but which flood the market when the price is remunerative. Celestine is chiefly used for the sugar beet industry and to a smaller extent in pyrotechnics.

Award for Petroleum Research.—H.M. Government is offering an award of £2000 to the first person, or persons, who can submit, on or before August 1 next, to the Lords Commissioners of the Admiralty and H.M. Petroleum Executive a fuel oil for Admiralty use by admixture of dehydrated coal tar with mineral petroleum oils. The oils may be derived from: U.S.A. Gulf Fields, Persia, U.S.A. Northern Fields, Borneo, Mexico, Burmah, Trinidad, or the United Kingdom. The necessary samples of tars and mineral oils will be provided free of cost on the understanding that all experimental results shall be placed at the disposal of the Government. Communications should be addressed to: The Controller, Munitions Mineral Oil Production Department, 8, Northumberland Avenue, W.C.2.

Copper in the Belgian Congo.—The Acting British Vice-Consul at Elisabethville reports as follows:—The mineral industry of the Katanga is practically confined to the operations of L'Union Minière du Haut Katanga. The company holds the mineral rights over a large area of country, which is known to contain copper, tin and gold, but only the first named is at present being worked on a large scale, and practically the whole of it has been obtained from the richer ores of two mines, the Star of the Congo and the Kambove. The blast furnace process of extraction has been employed since 1911. The central smelting plant is at Lubumbashi, near Elisabethville, and at present consists of five blast furnaces, of which four are in continuous operation. Two additional furnaces are in course of construction, and will be ready for use very shortly. The completed plant will have a daily capacity of 100 tons of copper. The output of the furnaces during the first nine months of 1917 was 19,766 metric tons, as compared with 21,273 tons in the calendar year 1916, and 13,483 tons in 1915. It is estimated that the output for the year 1918 will be 40,000 tons.

Enormous quantities of ore have been proved of a lower grade than is possible to treat economically by smelting, and after exhaustive experiments a plant is in course of preparation for the treatment of these ores by leaching and the electrical deposition of the copper. This plant is to have a yearly capacity of 50,000 tons of copper. The programme of expansion and development, commencing from the present time up to the year 1921, provides for an expenditure of £3,000,000.

From 1911 until the outbreak of war the whole of the Company's output was sold to Germany. Since the commencement of hostilities it has been sent to the United Kingdom. The company employs 450 Europeans and 7000 natives. The scarcity of labour during 1917 was very serious.—(*Bd. of Trade J., April* 25, 1918.)

Chemical Industries in Japan.—H.M. Commercial Attaché at Yokohama reports that prior to the war Japan had become self-supporting as regards the majority of paints. A small export business had even been initiated, and orders had begun to arrive from China, Netherlands East Indies, India and Australia, owing to the suspension of imports into these countries from the United Kingdom. The value of exports of paint from Japan rose from 70,643 yen in 1913 to 236,484 yen in 1916. Imports of ordinary paint into Japan have much decreased, but imports of ship's bottom paint and varnish have increased with the development of shipbuilding, etc. 356,374 yens' worth of the former were imported in 1916 as compared with 154,036 yen in 1913, and, as regards the latter, imports were valued at 222,714 yen in 1913, and 278,081 in 1016. Since the war a number of Japanese paint factories have been extended and several new factories have been built.

A company is to be established in Kurume (Kyushu) for the manufacture of industrial chemicals and paints. A share capital of 500,000 yen has been subscribed. From the vegetable wax, of which there are abundant supplies in the neighbourhood, it is proposed to manufacture glycerin, stearin, pitch and soap wax. Other products will be potassium permanganate, potassium carbonate and paint. According to the scheme which has been drawn up, 600 tons of raw materials will be treated per annum, from which 42 tons of glycerin, 420 tons of stearin, 60 tons of pitch, and 60 tons of soap wax are to be obtained.

It is proposed to establish a factory at Sapporo (in the Hokkaido) for the manufacture of starch from potatoes and grain. The company concerned is stated to have a capital of 1,500,000 yen. The estimated annual output of the factory is given as 6,000,000 lb. of first grade, and 500 000 lb. of second grade potato starch; and 2,000,000 lb. of first grade and 600.000 lb. of second grade corn starch. This will be an entirely new industry in the Hokkaido.

A firm has been making preparations for the manufacture of chromic acid at Toyosaki-machi, near Osaka. It is reported that arrangements have now been completed, and that the goods will be placed upon the market in the near future. As regards the supply of raw material, the firm is stated to have recently concluded an agreement for the import of chrome ore from abroad, 4.000 tons at each shipment, as the Japanese ore is of too low a grade.

A useful substitute for cotton has been made from sea-weeds ("sugamo" or "gomo gomo"), which is found abundantly in Japan and has been used hitherto as a fertiliser. The discovery was made in the Tokio Fibre Laboratory, and it is estimated that an annual production of 100,000,000

kwamme (about 826,700,000 lb.) can be attained. The process of manufacture consists in boiling the weed in ashy water, and then in water mixed with rice bran; after thorough boiling the material is bleached.

An extensive deposit of anthracite is reported to have been discovered in the vicinity of the Maizuru Admiralty Port, near Tsuruga. The deposit, it is stated, extends over an area of 25,000,000 tsubo (tsubo=3 95 sq. yds.); there are eight strata, each of which is 10 to 20 ft. deep and contains five rows of veins.

The following appeared in a recent issue of the *Japan Advertiser*:—"The latest report from the Government mining bureau states that the output of pig iron in Japan and its colonies for the present year is estimated at 745,000 tons, while steel is to be produced to the extent of 1,155,000 tons; and, in addition, 820,000 tons of shape steel is to be manufactured. If this estimate is not exaggerated, it may go a long way to make Japan independent of foreign imports of pig iron and steel.—(*Bd. of Trade J., April* 18 *and May* 16, 1918.)

Economic Importance of the Ukraine.—The boundaries of the Ukraine have yet to be definitely fixed, but roughly it includes the three Russian districts known as "Little Russia," "South-Western Territory" and "New Russia." Its area is 10 per cent. and its population 20 per cent. of the whole of European Russia. It belongs in great part to the "black soil" region and the ground is particularly suitable for the cultivation of sugar beet. The Ukraine occupies the first place in the extensive Russian beet-sugar industry, supplying in 1913-1914 no less than 60 per cent. of the total Russian output of 1,600,000 tons.

The mineral wealth of the region lies in great part in its iron ore; it supplies about 70 per cent. of the ore needed in the Russian iron and steel industry. The chief deposits are found in the Krivoi Rog region, which supplied 5,000,000 tons of iron ore in 1913. 200 to 250 miles from these deposits are situated the rich coalfields of the Donetz basin, which produce large quantities of good coking coal and anthracite. This proximity of coal and iron ore has enabled the south far to outdistance the older iron and steel industry in the Urals. In addition to the above, 2,000,000 tons of iron ore were produced in the Kerch region, in the Crimea. Owing to the convenience of transport most of this was exported.

Altogether, there were, in 1913, 14 iron and steel mills in the Ukraine, employing 58,000 men and producing 3,500,000 tons of iron, about two-thirds the total production of Russia. These mills were financed largely by French and Belgian capital.

In addition to the iron ore, other valuable minerals such as manganese and graphite are found in the Yekaterinoslav district; in 1913, 280,000 tons of manganese and 2,000 tons of graphite ore were mined.

Other industries include the beet sugar industry already mentioned, also distilling, tobacco manufacturing and tanning. Transport is comparatively good, the port of Odessa with its five harbours being available, together with 8200 miles of railway, which is 23 per cent. of the total mileage of European Russia, exclusive of Finland.—(*U.S. Com. Rep., Mar.* 21, 1918.)

West Indian Annatto Dyes.—Some years ago the Commissioner for Agriculture discovered a simple method of extracting colouring matter from annatto seeds. These are washed in a dilute solution of ammonia, the solution strained off and evaporated to a paste in a steam-heated pan, when an annatto paste is obtained of greater brilliancy than that usually made. The (British) Department of Scientific and Industrial Research states that annatto is now chiefly used for colouring butter and cheese and but little as a dyestuff, but should the substance again come into demand, the above process could easily be carried out and the concentrated paste exported, instead of the bulky seeds. The extracted seeds could be used for oil manufacture, or as cattle food.—(*U.S. Com. Rep., Feb.* 12, 1918.)

Indigo in South Fukien Province (China).—Until 20 to 25 years ago, practically every part of China produced its own indigo, but when the importation from abroad commenced, principally from Belgium and Germany, the amount grown locally gradually diminished. This was due to the high quality of the synthetic product, one part of which was equivalent to twenty parts of the native product and cost five to twenty times as much, according to the quality of the latter.

The war cut off the supply of German indigo and the local industry has now revived, with the result that South Fukien produces enough indigo to satisfy its own needs. The three centres of production are Changchow, Chuanchow and Tungan, all three being also producers of native cloth. In the belief of local merchants, Belgium and Germany will not find the same market for their product after the war that existed formerly.

The crop is generally planted early in June and requires four months to mature. The grass is then placed in large casks, soaked for several days, and then treated with lime. The grass is afterwards removed, and after soaking for three or more days longer, the water is drained off, stirring well each day.—(*Textile Colorist, March*, 1918.)

German Substitute for Jute.—A memorandum on "Cellulon," an efficient substitute for jute, cotton and other fibres, has been received by the Foreign Office from H.M. Consul-General at Zürich, who has seen a sample of the cloth made from it, and which he describes as extremely strong. It is not easy to reconcile the various descriptions given of the process of manufacturing cellulon from pulp, but the accounts agree in describing the process, or processes, as a direct manufacture from wood pulp. H.M. Consul-General states that the method employed is on the same general lines as artificial silk manufacture—that is, by squeezing pulp under high pressure through small holes in plates. The *Münchener Neueste Nachrichten* gives some details of two processes: one, the invention of an engineer named Scherback, and the other the revival of a discovery made twenty-five years ago by Gustav Türk. In the Türk process, the cellulose pulp is conducted over drums, the surface of which is divided into parallels corresponding to the number of the yarn to be produced. The roving, which consists of a solid mass of cellulose, is taken from the drum by means of a special apparatus and then twisted (*i.e.*, finished or twined) on spinning machines. In the Scherback process, cellulose is added to cotton waste or wool in the ordinary mixed spinning process. The somewhat longer fibres of the cotton or wool bind together the shorter cellulose fibres, and thus a yarn is produced similar to cotton or woollen yarn.

However cellulon may be manufactured, there is no doubt that it is being exploited very actively in Germany, especially as a substitute for jute. The *Münchener Neueste Nachrichten*, which describes the extent of its adoption in Germany up to last month, states that many of the largest industrial concerns in the cellulose, paper and textile industries have already taken out licences for the working of this invention. The Cellulon Company has been formed by the existing licence-holders in conjunction with the proprietors of the patent (the Türk Co., Ltd., Hamburg), with the object of establishing a Research Company. H.M. Consul-General writes that the Augsburger

Spinnerei A.-G. is largely interested in the Cellulon Company, and that a very powerful combination of spinners and weavers has been formed. It appears that Swedish exporters are already offering to supply Swiss firms with wood pulp for the manufacture of cellulon on German lines, but that the German Government will not permit its transport through Germany. The Cotton Substitute Research Company above referred to, consists of fifteen large textile and cellulose manufacturers, and has already a factory at work in Forst and another in Cottbus. It is projecting the establishment of four other factories.

According to the *Correspondenz Textilindustrie*, the production of cellulon yarn will have to be reserved exclusively for the supply of the Army for a considerable time to come; and the experiments made so far have shown cellulon to be a thoroughly equivalent substitute for cotton, hemp, jute and linen.

There is some evidence that the Türk process is an old one, but that the allied Scherback process is new. At any rate, it is clear that a great deal of money is being spent in Germany on the development of cellulon, and that it is regarded seriously in Switzerland.—(*Bd. of Trade J., April* 25, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Postal Rates on Scientific Publications.

In the debate on the Post Office (No. 2) Bill, Mr. Wilson-Fox moved to insert the following words in Clause 1 dealing with the new postal rates, "Provided that transactions of any learned society, being a member of, or recommended by, the Conjoint Board of Scientific Societies, may be posted at the same rates as are applicable to registered newspapers." He argued that from the financial point of view the concession would be a very small one, but from the point of view of the societies, very considerable, and it would assist the spread of scientific knowledge. There would be no difficulty at the Post Office if the societies to which the concession would apply were registered just as newspapers are registered. Sir J. Larmor supported the amendment, but urged that it should be extended to cover the learned societies which represent literature. The British Academy might be the recommending body in this case. Sir P. Magnus also supported and said that the loss of revenue involved would be almost infinitesimally small, and the concession would further the cause of higher education. Mr. Anderson opposed the amendment on the ground that if the principle were allowed in this case, a number of other societies belonging to poor people would put forward a similar demand. Educational and trade union organisations would have quite as strong a claim. Mr. Booth and Mr. King advanced the same reason, and the latter remarked that the proposal was made in the interests of members of wealthy societies. He said "the Royal Society is extremely wealthy"—a statement which was strenuously denied by Sir J. Larmor. The Postmaster-General refused to accept the proposal because it would form a very dangerous precedent. The amendment was negatived without a division. (May 9).

BRITISH TRADE.

In Committee of Supply, the President of the Board of Trade said that the value figures of recent official trade returns did not give any reliable indication of the development of trade because the nature of the goods and the price-level had changed so remarkably. If the price-level for 1917 were assumed to be equal to that of 1913, the 1917 imports would be valued at £545 millions sterling, instead of 1065 millions, and the value of the exports (plus re-exports) would have been 375 instead of 595 millions. Comparison of these adjusted values with the 1913 figures gives a decrease of about 40 per cent. in the volume of imports and a decrease of about 30 per cent. in the value of the exports.

As regards the industrial position, the character of the work done has also changed very much, more than one-half of all the work-people being engaged on Government work. To-day in the fourth year of the war, the aggregate output of industry is about the same as what it was before the war. The new labour cannot be regarded as so efficient as that which it has replaced, but overtime, harder work, and the influx of 1,500,000 women workers have contributed to restore the balance.

Paper Supplies.

In normal times about 90 per cent. of the paper used in this country is either imported or made from imported materials, and these imports are now only one-fifth of what they were. In the current year it is estimated that about one-half of the paper and strawboard used will be made from home-produced materials, including waste paper, rags, rope, straw, sawdust, and various kinds of grasses. Sir A. Stanley drew the particular attention of the House to the "recently discovered method wereby through the use of sawdust it is hoped that a very considerable increase in the amount of paper manufactured will be possible."

The Dye Industry.

Although the activities of British Dyes, Ltd. had been restricted by the requirements of the Minister of Munitions, it and other dye undertakings had made very considerable progress—but not so rapid as was expected. Progress has been more in the direction of producing the commoner kinds rather than making advances in the direction of the more complicated range of dyes which were produced so abundantly in Germany before the war. The Government now proposed to advance loans to dye manufacturers at a fixed rate of interest, which would not be less than 5 per cent., for the purposes of manufacturing special dyes and extending buildings and plant. Where extensions for making expensive special dyes are needed immediately, the Government will make some provision to meet the cost. Grants for research work will also be forthcoming, and the importation of foreign dyes will be controlled by a system of licences for a period of at least ten years after the war. The licensing authority will be the Board of Trade and the Committee will comprise an equal number of representatives of dye makers and dye users, in each case nominated by these interests. An independent chairman of good business standing will be appointed by the President of the Board of Trade. With the objects of obviating overlapping and dispersion of effort, and of making the greatest possible use of the limited number of trained chemists available, an amalgamation of British Dyes, Ltd., and Messrs. Levinsteins, Ltd., was in contemplation.

At this point Sir W. Pearce asked if the grants and advantages offered by the Government will be confined to the two firms named, or whether in spite of difficulties, an opening will be left to other people who intend to explore the dye situation.

The President said that he understood that definite proposals have been considered, and are about to be placed before the shareholders of these

respective concerns for their consideration.* The Board of Trade had been consulted as to the bearing of the proposed amalgamation on national interests and certain conditions had been laid down whereby it was assured that the proposed new company would be permanently under British control, the Government would be represented on the Board of Directors, and provision would be made for reasonable prices and equitable distribution among consumers. (May 15.)

Cannel Coal.

Replying to a question from Captain Barnett asking for information concerning the many modified plants for the distillation of cannel coal now in operation at gas-works in Great Britain, and the production therefrom, Mr. Kellaway said that it is not desirable in the public interest to give details of production, but it may be stated definitely that gas-works in Great Britain are either now modified or in process of modification to enable all the cannel coal which is known to be available to be carbonised for the production of oil. The process so far has been an unqualified success, and the results are even better than were expected.—(May 6.)

T.N.T. Poisoning.

In answer to a question on this subject, Mr. Kellaway informed the House that the preventive measures taken by the Ministry of Munitions against T.N.T. poisoning had been increasingly effective. The number of cases reported during the last quarter of 1916 was 86, with 23 deaths. The comparison figures for 1917 were 29 cases, with 4 deaths.—(May 8.)

Inventions (Cost of Trials).

Replying for the Chancellor of the Exchequer to a question put by Mr. Smallwood, Mr. Kellaway said that the expenses of any trial decided upon by the authorities are borne, should the inventor so desire, by public funds if carried out by the proper authorities or at their request. Further, if necessary, preliminary practice can be authorised, the expense of which is borne, if the inventor so desires, by public funds.—(May 13.)

Commercial Conventions.

Mr. Bonar Law stated, in reply to a question from Sir E. Carson, that the Council of Ministers in France had denounced all commercial conventions containing a general clause regarding most-favoured nations, and that it was the intention of H.M.'s Government to adopt a similar course.

Treatment of "Gassed" Soldiers.

In a written answer to Sir G. Greenwood, Mr. Macpherson intimated that the Chemical Warfare Medical Committee had duly considered the question of the use of the "Quain" ozone producer, and had reported that it would be highly injurious to employ ozone in the treatment of "gassed" cases.—(May 13.)

Sugar.

In response to a written inquiry by Mr. Lough, Mr. Baldwin gave the following particulars concerning the quantities of sugar, refined and unrefined, imported into the United Kingdom: For the year ended March 31, 1917, 1,442,000 tons, and for the year ended March 31, 1918, 1,386,000. These figures represent the amount imported, not the amount consumed, in the United Kingdom, and to divide them by the estimated population resident in the United Kingdom would clearly give a misleading result.—(May 15.)

* The following reply to the above question was issued subsequently:—As I stated in the discussion on the Board of Trade Vote on May 15, it is not proposed that the amalgamation of British Dyes, Limited, and Levinstein, Limited, if carried through, shall have any privileged position in respect of the new scheme of Government assistance to the dye-making industry, which will be given to all British undertakings able to make effective use of it.—(*Times*, May 20.)

LEGAL INTELLIGENCE.

APPLICATIONS AT THE PATENTS COURT FOR LICENCES TO USE ENEMY PATENTS.

The Manufacture of Hydrogen.—On May 9, before the Comptroller of Patents at the Patents Court, an application was made by Messrs. Samuel Cutler & Sons, Ltd., engineers, of London, for a licence to use six German patents for the manufacture of hydrogen for different chemical purposes. One of the patents in question, No. 18,028 of 1913, claimed to cover the discovery that manganese iron ores could be used as reaction substances in the production of hydrogen. The other patents were Nos. 21,479 of 1908, assigned to the Wasserstoff Akt.-Ges., 12,212 and 12,243 of 1912, and 17,691 and 17,692 of 1913.

Mr. Temple Franks, the Comptroller of Patents, observed that it was rather novel to claim to patent a scientific discovery, and it might be that the validity of the patent could be contested.

The applicant replied that he was prepared to admit the validity of the patent without prejudice in order to get on with the supply of plant and the manufacture of hydrogen for balloons and airships. Mr. Tennant, for the applicants, said that the employment of a low temperature was one of the points. The oxide hitherto used in the production of hydrogen was of a value round about 50s. per ton. It was conceivable that the manganese iron ore would be found to improve the production by 20 per cent., but, of course, the cost of all materials had increased. He suggested a royalty of 10s. per ton of manganese iron ore used under this particular patent. The patent No. 21,478/1908 claimed the employment in the production of hydrogen of ferric oxide, obtained in the fragmentary state from iron sulphide ores for the production of the spongy iron. The volume of steam employed was not to exceed half other specified combined volumes. Production was arrested when the oxide was only partly produced for the purpose of preventing the deposition of carbon, and he suggested that in these cases the royalty per ton of oxides would be appropriately 5s. This would be better than intercepting the supply of hydrogen by meters for measurement. The installations to be set up would be used at present exclusively for Government purposes, but later on they might be required for other people, partly for private purposes and partly to supply passing airships—so that the advent of garages for the supply of airships was foreshadowed. The Comptroller intimated that the matter seemed to be of great national and scientific interest, and he would recommend to the Board of Trade that the licences be granted without delay.

Manufacture of "Syntan."—On May 15, Messrs. W. L. Ingle, Ltd., Millshaw Leather Works, Chirwell, Leeds, the Yorkshire Dyeware and Chemical Co., Ltd., of Kirkstall Road, Leeds, Mr. H. McArthur of Liverpool, and Messrs. Joseph Turner & Co., Ltd., of the Chemical Works, Queensferry, Cheshire, asked for licenses to use two German patents, Nos. 4648 of 1911 and 24,216 of 1912, for the manufacture of "Syntan" for the tanning of leather.

It was stated by Mr. G. B. Ellis, patent agent, that the Calder and Mersey Extract Co., Ltd., of Liverpool, had been given licences to use three patents for the manufacture of "Syntan" and the aim of the present application was to put all the English licencees on the same footing. One of them had one licence only, and in two other cases no licence had yet been formally issued.

The Comptroller after hearing the application said that he would recommend to the Board of Trade that the licences be granted. All the licencees should have patents upon the same terms, and Mr. Ellis had made out a case for the revision of royalty. This was originally fixed upon a percentage basis, but nobody anticipated that the war would have gone on so long, or that the price of materials would have risen so high. In future he would recommend a royalty on a fixed rate per ton, and although £1 was suggested in the case of Messrs. Ingle, Ltd., he thought perhaps 10s., for which Mr. Ellis contended, would be satisfactory. He should advise that that be the royalty all round, and the applicants would hear from the Board of Trade at an early date as to the issue of their licences.

GOVERNMENT ORDERS AND NOTICES.

GLASS CONTROL AMENDMENT ORDER.

An Order was issued by the Minister of Munitions on May 7 extending the provisions relating to electric lamp glass, contained in the Glass Control (Consolidated) Order, 1917, to Vitrite and other glass used in the manufacture of electric lamps for insulating purposes. Applications to the Controller of Glassware Supply, Ministry of Munitions, 22-23, Hertford Street, London, W.1.

RETURNS AS TO BOILERS.

The Minister of Munitions has made the following Order, dated May 7:—

(1) Every person shall furnish to the Controller, Department of Engineering, Ministry of Munitions, such returns as to boilers belonging to him or in his possession or under his control, in such form and at such times as shall from time to time be notified to him by the said Controller.

(2) Any returns so furnished shall be verified by the signature of the person required to furnish the same, or where such person is a firm or company by the signature of a partner, director or other responsible officer.

(3) This Order may be cited as the Boilers (Returns) Order, 1918.

SULPHURIC ACID (AMENDMENT OF PRICES) ORDER, 1918.

The Minister of Munitions has issued the following Order, under date May 10:—

1. As on and from the 1st June, 1918, the maximum prices for sulphuric acid specified in the schedule to this Order shall be deemed substituted for those specified in the schedule to the Order relating to sulphuric acid made by the Minister of Munitions on the 29th May, 1917, and such last-mentioned Order shall accordingly operate and have effect as though the prices specified in the schedule hereto had originally been fixed by the said Order as the maximum prices to be charged or received in payment by manufacturers of sulphuric acid or agents of such manufacturers for sulphuric acid supplied by or through them on or after the 1st June, 1918.

2. This Order may be cited as the Sulphuric Acid (Amendment of Prices) Order, 1918, and the said Order of the 29th May, 1917, as the Sulphuric Acid Order, 1917, and both Orders may be cited together as the Sulphuric Acid Orders, 1917-18.

[NOTE.—All applications in reference to this Order should be addressed to the Director of Acid Supplies, Ministry of Munitions of War, Department of Explosives Supply, Storey's Gate, Westminster, S.W.1.]

THE SCHEDULE.

MAXIMUM PRICES FOR SULPHURIC ACID.

1. Weak acid, *i.e.*, acid of all strengths up to and including 90 per cent. H_2SO_4.

	Maximum price per ton.
Class A. *Arsenical Acid	83s.
Class B. †Non-arsenical or de-arsenicated acid	98s.

* For acid at 140° Tw. at 60° F. with an increase or reduction of 6d. in respect of each complete degree Twaddell by which the specific gravity is more or less than 140° Tw. at 60° F.

† For acid of 140° Tw. at 60° F. with an increase or reduction of 7d. in respect of each complete degree Twaddell by which the specific gravity is more or less than 140° Tw. at 60° F.

2. Concentrated acid, *i.e.*, acid of all strengths over 90 per cent. H_2SO_4.

Mono-hydrate (H_2SO_4) content of acid.	Maximum price per ton. Class C. Arsenical acid.	Class D. De-Arsenicated or Non-arsenical acid.
	£ s. d.	£ s. d.
Over 90% and up to 91%	5 9 0	5 19 0
,, 91% ,, 92%	5 15 0	6 5 0
,, 92% ,, 93%	6 1 0	6 11 0
,, 93% ,, 93½%	6 7 0	6 17 0
,, 93½% ,, 94%	6 10 0	7 0 0
,, 94% ,, 94½	6 13 0	7 3 0
,, 94½ ,, 95%	6 16 0	7 6 0
,, 95% ,, 95½	7 1 0	7 11 0
,, 95½% ,, 96%	7 6 0	7 16 0

Over 96 per cent. in both classes, an addition of 1s. per ton, for each complete one-tenth of 1 per cent. of additional mono-hydrate.

PACKAGES.

All the above maximum prices are for acid delivered into tank wagon, tank cart or tank barge at makers' works.

When the acid maker supplies the railway tank wagons he shall be entitled to make a further charge of not more than 5s. per ton for hire of such wagons, and also to charge demurrage on tank wagons detained at the purchaser's sidings for more than one clear day, exclusive of the days of arrival and despatch, at a rate not exceeding 6d. per ton capacity per day in respect of each clear day, after the first during which the same are so detained.

When the acid maker supplies the acid in his own drums he shall be entitled to make a further charge of not more than 10s. per ton for filling and hire of drums. When drums are supplied by the purchaser, a charge of 2s. per ton may be made to cover the cost of filling.

When the acid is supplied in the acid maker's own carboys, he shall be entitled to make a further charge of £1 per ton for filling and hire of carboys. When carboys are supplied by the purchaser, a charge of 5s. per ton may be made by the acid makers to cover the cost of filling.

EXTRA CARRIAGE.

In cases where a maker of sulphuric acid has, in order to supply his customers, to purchase supplies of acid from a third party, it will be permissible for him, in so far as this is a departure from his normal procedure, to charge to his customers any extra cost of carriage thereby incurred.

AMMONIA CONTROL ORDER, 1918.

On May 17 last the Minister of Munitions issued an Order under the above title providing that:—From June 1 next, no ammonia or ammoniacal product may be manufactured except under licence. No licence is required for the manufacture of (A) crude ammoniacal liquor or sulphate of ammonia in any quantities, or of (B) any other ammoniacal product, in quantities not exceeding ½ ton, during any one calendar month.

The above regulation also applies to the supply of ammonia, etc., but no licence is required for amounts of anhydrous ammonia not exceeding 56 lb., or of ammoniacal liquor or products not above 1 cwt., in one month.

All instructions issued by the Minister with a view to avoiding loss or waste of ammonia must be complied with. Returns of stocks, etc., are to be furnished as and when required.

"Ammonia" shall mean and include anhydrous ammonia and ammonia in aqueous solution. "Crude Ammoniacal Liquor" shall mean an aqueous solution containing not more than 5 per cent. of ammonia.

Nothing contained in this Order shall affect or exempt compliance with any provisions of the Fertiliser Prices Order, 1918, relating to sales or deliveries of sulphate of ammonia.

All applications to be addressed to M/M, Dept. of Explosives Supply, Storey's Gate, Westminster, S.W.1., and be marked "Fertiliser Section."

[The full text of the Order is given in the *Londod Gazette* of May 17.]

Notice under the Fertiliser Prices Order, 1918.—A general licence is given to agricultural merchants and dealers, including co-operative societies and companies, to sell superphosphate, sulphate of ammonia, and ground basic slag.

OTHER ORDERS, ETC.

Tobacco and Matches Order, 1917. Amendment, April 23.

Domestic Sheep Skins (Amendment) Order, 1918. Army Council. May 2.

Fertilisers and Feeding Stuffs Act, 1906. Notice by the Board of Agriculture and Fisheries to issue:—Fertilisers and Feeding Stuffs (Methods of Analysis) Regulations, 1918. May 4.

Small Tools Order, 1918. Ministry of Munitions. May 10.

Scutch Mills (Ireland) Order, 1918. Ministry of Munitions. May 17.

Sale of Wool (Great Britain) Order, 1918. Army Council. May 13.

PROHIBITED EXPORTS.

By an Order in Council dated May 14 the list of prohibited exports was further amended as follows:—

(1) *That the following headings should be deleted:*

(A) Nux vomica and its preparations; (B) Podophyllum rhizome; (A) Cork and cork dust; (A) Cotton, Sea Island, yarn made from or containing: (B) Ferro-nickel; (B) Gluestock of all kinds, including animal hoofs, untanned hides and pelts not otherwise specifically prohibited, fish bladders and fish skins; (B) Hides and pelts, clippings of; (C) Oiled cloth and tape; (C) Vulcanised fibre; (B) Nickel, alloys of nickel, and nickel ore; (C) Nickel manufactures, not otherwise prohibited (except nickel-plated goods); (A) Photographic sensitive films, plates, and printing paper, whether exposed or not; (C) Rattan, woven; (B) X-ray apparatus.

(2) *That the following headings should be added:*—

(A) Cement for building and engineering purposes. (A) Kola seeds; (B) Nux vomica and its preparations: (A) Podophyllum rhizome; (A) Cork and cork dust, and articles manufactured therefrom, not otherwise specifically prohibited; (A) Cotton yarn made from or containing Sea Island cotton, whether grown in the United States of America or the West Indies: (A) Gluestock of all kinds, including animal hoofs, untanned hides and pelts, not otherwise specifically prohibited, fish bladders and fish skins: (A) Hides and pelts, clippings of: (A) Ingot moulds manufactured of hæmatite iron: (A) Oiled insulating cloth, paper, silk and tape; (B) Vulcanised fibre; (A) Nickel, its ores, alloys, and manufactures (except nickel-plated goods not otherwise prohibited); (A) Photographic materials, sensitised, of all kinds, whether exposed or not; (A) Rattan, woven; (A) X-ray apparatus.

EXPORTS TO NORWAY AND DENMARK.

The Director of the War Trade Department announces that it has been decided to resume the issue of licences in approved cases. Schedules of the articles and materials affected are to be found in the *Board of Trade Journal* for May 16.

REPORT.

INTERIM REPORT ON CERTAIN ESSENTIAL INDUSTRIES BY THE COMMITTEE ON COMMERCIAL AND INDUSTRIAL POLICY. 1918. [*Cd.* 9032. 2*d.*]

The report of Lord Balfour of Burleigh's committee does not deal with the great staple industries, which are in most cases being examined by special expert committees, but with the lesser industries which are essential to national safety and which have come to be known as "key" or "pivotal" industries. The majority of those considered are chemical industries, and include:—Synthetic dyes, spelter, tungsten, optical and chemical glass, thorium nitrate, barytes, and drugs.

Steps have already been taken to secure permanent supplies of dyes. British Dyes, Ltd., has been formed and assisted by a Government loan of £1,700,000, and a research grant of £100,000. It is further proposed to protect the dye industry by prohibiting the importation of foreign products for a term of years.

In the case of spelter, two large works have been erected in the United Kingdom, also with State financial assistance. A ten years' agreement has been made for the purchase of the zinc ore and concentrates from Australia, and advances have been made to the Australian Government for purposes of developing the spelter industry.

Tungsten is required for the manufacture of high-speed tool steel, which is an absolute necessity in modern engineering. The wolfram ores are largely produced within the British Empire, notably in Burma and Australia, and the supply is ample to meet all our normal requirements. Before the war practically all the tungsten was produced in Germany, but a number of works in this country are now engaged on the reduction of tungsten ores, and the Colonial Governments have arranged to send all their ores to us. To retain the products of the Colonial mines within the Empire, it is proposed as a post-war measure to levy a penalty duty of £25 per ton on all ore sold to foreign buyers without a licence; and to prevent the mines falling under foreign control, the transfer of leases, concessions, etc., without a Government certificate is to be prohibited. Assuming that the supply of raw material is assured by the above measures, it is reckoned that the newly-established works in this country will

be sufficiently strong to resist German competition after the war, without any further protection.

The optical and chemical glass industries require special treatment, since, although of vital national importance, they do not carry possibilities of profit commensurate with the amount of technical and scientific skill necessary for their successful prosecution. Before the war this country was virtually dependent on Germany for these essential articles. We have now a number of plants working in this country, and the firms concerned have received Government support both on the financial and technical sides. A special sub-committee of the Department for Scientific and Industrial Research has been set up to deal with the latter. In certain cases Government Departments have made agreements for a period of ten years for the supply of war material, and they have undertaken to specify British-made glass in all orders for optical instruments. It is proposed to prohibit the import of certain kinds of glass and optical instruments, but in order that research workers may be supplied with the best possible apparatus, the exclusion of foreign instruments must be subject to the condition that an adequate supply of the highest quality is available in this country.

Prior to the war, thorium nitrate production was a German monopoly, which controlled the monazite sand deposits of Brazil and Travancore (India). The German element has been eliminated from the Travancore company, and the Brazilian mines have fallen into French hands, so that an adequate supply of monazite sand at reasonable prices seems assured. The manufacture of incandescent gas mantles, in which the thorium nitrate is used, presents no special difficulties, and no other Government action appears necessary, beyond asking the Indian Government to prevent the monazite deposits again getting into foreign control.

Ample deposits of barytes, which is needed for colour and asbestos manufacture, exist in this country, but production is handicapped by the mines being in remote districts. Except for the provision of improved transport where necessary, the matter does not call for special Government action.

The question of making the Empire self-supporting in the matter of drug supplies is discussed in detail in an appendix furnished by the National Health Insurance Commission. The subject falls into two sections, viz., raw materials and manufactured drugs. Of the raw materials which either do not occur or occur only in inadequate quantities within the Empire, bromine, bismuth, iodine, potassium and mercury are mentioned, and the National Health Insurance Commission suggests that surveys should be undertaken with a view to the discovery of fresh sources of these materials.

Bromine in the form of potassium bromide is required for the treatment of epilepsy and nervous ailments. The only known deposits outside Germany are in the United States, and since the war the latter has been the Allies' only source of supply. Bismuth is used for digestive ailments and especially for dysentery. It is chiefly derived from Bolivia, where the mines were previously under German control, but deposits occur also in Australia and South Africa. Iodine is used in enormous quantities as an antiseptic in military surgery. The world's supply is controlled by a syndicate, and is chiefly derived as a by-product from the Chilian nitrate industry. Appreciable quantities, however, are produced from kelp in Norway, France, Ireland, Scotland, and Japan. The commissioners suggest that the British kelp industry should be assisted by bounties and that large stocks should be maintained under Government control. As regards potash and mercury, the greater part of the consumption is used in industry, and it is suggested that sufficient for medicinal purposes could be obtained within the Empire by the development of known sources and systematic surveys for the discovery of new sources.

Of the home-grown medicinal herbs, belladonna, henbane, foxglove and colchicum are the most important, and there is every reason to believe that this country can be made self-supporting in respect of their supply.

Turning to tropical vegetable products, there are three which are not grown sufficiently within the Empire, namely, cinchona, ipecacuanha and coca, which yield the alkaloids quinine, emetine and cocaine respectively. The Indian Government has already developed the growth of cinchona and it should be possible to increase the supply so as to make us independent of the present Java and Dutch sources. After the outbreak of war marked shortage of quinine was prevented by the large stocks held in London. Ipecacuanha is derived mainly from South America, but grows well in the Straits Settlements. The manufacture of emetine, an important remedy for dysentery, is carried on in the United Kingdom. Ceylon should be able to supply sufficient coca to produce all the cocaine required for legitimate use. The manufacture of cocaine before the war was entirely in German hands.

Steps must be taken to prevent British supplies of raw materials from falling under foreign control, and to attract them preferentially to this country, without raising the prices to British manufacturers.

With reference to manufactured drugs, many of which are synthetic coal-tar products, the following may be regarded as essential: Salicylic acid and derivatives, salvarsan, neo-salvarsan, novocain, phenacetin, phenazone, eucaine, liquid paraffin, and thymol. Germany previously held a monopoly in such products, and to protect the new British undertakings against post-war competition it is recommended that restrictions be imposed on the importation of a few drugs, such as the above, from Germany, and on the exportation of raw materials, *e.g.*, coal tar, from this country.

As the economic, political and international conditions are bound to vary from time to time, the number and kind of essential industries will likewise change, as will also the treatment necessary for their successful working. It is therefore proposed to establish a permanent board (called provisionally the Special Industries Board) of commercial and industrial experts, entrusted with the care of those industries concerned with the production of commodities which are essential to the Empire's well-being. No State grants should be made except on the recommendation of the Board, which should deal with all questions relating to protective tariffs, and the granting of licences for the import of otherwise prohibited goods. The Board should be in close co-operation with the Department of Scientific and Industrial Research, and must keep in touch with the current naval and military needs as regards munitions, as well as the international political relationships of this country.

The maintenance of efficient and adequate production at reasonable prices must be a condition of the continued receipt of State assistance, and failing adequate output the Government should itself undertake the manufacture of such articles as may be essential to national safety.

The report concludes with a memorandum by Mr. Pease, who agrees with the formation of a Special Board, but believes that prohibition and high protective tariffs will not establish these industries on a sound basis, and that the policy of subsidies would not conduce either to economy of production or to private enterprise and initiative.

—A. R. R.

TRADE NOTES.

FOREIGN.

Cacao in the Dominican Republic.—The two Dominican harvests for 1917 are expected to yield 48,400,000 lb. of cacao, slightly less than in for the previous year. The market has fluctuated greatly, showing a downward tendency. Almost all the crop is shipped to New York, whence a great deal is transhipped to Europe.—(*U.S. Com. Rep., Jan.* 17, 1918.)

Venezuela (Maracaibo).—The staple products of this district include sugar, cacao, copaiba, cogollos, divi-divi, hides and skins. Generally speaking, the year under review (1916) was a good one. Sugar is the only manufactured article exported. Till recent times, the factories only made a brown sugar, called papelón, polarising at 70°—75°, and used for local consumption or export to Curaçao. In 1916, papelón to the value of £3200 was exported to England for the first time. The mills have now started the manufacture of white sugar, having exported it to the U.S.A. to the value of £12,000 in the last few months of 1915, and £126,000 in 1916. This sugar pola ises round 97°. The sugar cane grows more densely than in Cuba, but is of lower sugar content (6—7 per cent.). The climate also militates against the establishment of a sugar industry.

Cacao is raised on the mountain slopes and is exported in the form of beans, chiefly to the U.S.A. Cogollo, a fibre used for making a hat of the Panama type, is also grown. Copaiba, the sap of a tree which grows wild in the district, was exported to the amount of 146,365 lb., an increase of 40 per cent. on the previous year. Cotton is raised in limited quantities, 3000 bales being ginned during the year. Divi-divi, the dried fruit of the divi-divi tree, is exported at present as such in bags of 100—110 lb., but it is proposed to erect a factory at La Guaira to extract the tannin and thus save freightage. The exports of this material in 1916 amounted to 9,656,828 lb., an increase of 35 per cent. Hides and skins are also exported: hides (1,491,505 lb.) showing an increase of 29 per cent., and goatskins (296,865 lb.), an increase of 17 per cent. Deer-skins and wool are also exported to a slight extent.

The imports included the following items of chemical interest:—Calcium carbide (£4500), Portland cement (£8900), Cinchona bark and alkaloids, etc. (£4700), disinfectants (£2700), explosives (£6900), gasoline and kerosene (£7800), lubricants (£2340), medicinal preparations (£49,000), paints and pigments (£6700), perfumes and cosmetics (£4300), rosin (£2900), soda (£3500), stearin (£12,300), acids and nitrates (£5000). The bulk of these articles were imported from the U.S.A.—(*U.S. Com. Rep., Feb.* 16, 1918.)

Production of Cottonseed and Cottonseed Products in the U.S.A.—During the period Aug. 1, 1917, to Jan. 31, 1918, the amount of cottonseed received at mills in the U.S.A. was 3,544,509 tons, the amount crushed during that period being 2,707,628 tons. The following table shows the quantities of cottonseed products manufactured, shipped out and on hand during that period:—

Sweden.—The Swedish sulphite spirit factories have recently formed a company for the organisation and sale of their entire output. The company intends to devote itself particularly to the sale of "motor spirit" as a substitute for petrol, and thus to compete with the petroleum interests. It is reported that about twelve sulphite spirit factories are in course of construction, all of which are expected to start within a year, and that the annual output from these factories will be from 15 to 20 million litres. As Sweden's normal import of benzine is about 25 million litres, she will thus be able, assuming the above estimate to be correct, to replace the bulk of her imports of petrol by Swedish made motor spirit.—(*Bd. of Trade J., April* 25, 1918.)

Import Trade of the United States in Gas Mantles and Monazite Sand.—The following figures, show the value and country of origin of the gas mantles imported into the United States during 1912—16:—

Value in dollars.

Imported from	1912.	1913.	1914.	1915.	1916.
Austria	—	83	915	—	—
Belgium	—	6	—	—	—
France	11	32	15	2	—
Germany	62,091	49,208	14,440	17,172	3,326
Netherlands	358	2,948	14,660	6,385	1,064
Sweden	—	33	—	—	—
Switzerland	472	3,669	6,767	2,395	936
United Kingdom	2,252	5,627	42,042	13,538	449
Japan	535	207	1,285	1,813	616
Canada	242	453	318	256	253
Total ..	65,961	62,266	80,442	41,561	6,644

It will be observed that before the war the value of the incandescent mantles imported from the United Kingdom was small, but in 1914 the amount increased to more than seven times that of 1913, whilst the quantity from Germany was reduced to one-third. The value of the mantles imported since 1914 reflects in some measure the progress which has been made in the United States in the manufacture of thorium nitrate. This point is also emphasised by the increasing quantities of monazite sand imported as shown by the following table:—

Quantity in lb.

	1912.	1913.	1914.	1915.	1916.
Germany ..	—	—	—	45	—
United Kingdom	—	—	—	291,342	1,170,721
Canada ..	—	—	—	2,500	—
Brazil	1,115,429	1,104,984	1,102,300	1,464,963	352,780
	1,115,429	1,104,984	1,102,300	1,758,850	1,523,501

Although the actual weight of sand imported in 1916 was lower than in 1915, the quantity of thoria contained was about 30 per cent. greater. This is due to the fact that the sand credited as being imported from the United Kingdom was probably all raised in Travancore, Southern India, and contained nearly twice as much thoria as the Brazilian material.—(*Statistics from U.S. For. Comm. Navig. for year ending June* 30, 1916.)

Items	On hand Aug. 1, 1917.	Produced Aug. 1 to Jan. 31.	Shipped out Aug. 1—Jan. 31.	On hand Jan. 31, 1918.
Crude oil .... lbs.	15,477,352	816,166,391	678,395,939	192,940,119
Refined oil .... lbs.	298,757,126	565,811,513	—	208,430,610
Cake and meal .... tons	92,540	1,298,527	1,235,179	155,888

—(*U.S. Com. Rep., Feb.* 20, 1918.)

Tallow Market at Hankow.—Hankow is an important market for the purchase of both animal and vegetable tallow, exporting 82 per cent. of the entire Chinese output of vegetable tallow. Usually, about 75,000,000 lb. of animal tallow and 350,000,000 lb. of vegetable tallow are exported annually, but in 1916 these figures rose to 211,622,667 lb., and 569,960,267 lb. respectively. —(*U.S. Com. Rep., Mar.* 7, 1918.)

Guadéloupe (*French West Indies*).—1916 was a year of good crops and high prices in this colony. The output of sugar products as shown by exports was about the same as in 1915, the figures being 183,382 gallons of molasses, 3,278,442 gallons of rum, and 37,593 tons of sugar, but the high price of rum caused a large increase in the production, shortage of tonnage preventing this excess from being exported. The cacao crop suffered from heavy winds but an excellent crop of vanillin was obtained, 69,401 lb. being exported.

The imports to the colony included 567,309 lbs. of cement; 96,807 lb. of sulphuric acid; 17,192 lb. of other chemicals; 4161 tons of fertilisers; 797,842 lb. of cottonseed oil; 2,918,959 lb. of refined mineral oil and 360,123 lb. of heavy mineral oil; 1290 tons of salt and 631,620 lb. of soap. In normal years, most of the trade of the colony is with France, the preferential tariff on French goods making it difficult for other countries to compete. At present, the U.S.A. has secured some of this trade, supplying 50 per cent. of the total imports, but it is doubtful if this competition will survive the war.—(*U.S. Com. Rep., Mar.* 13, 1918.)

Peanut Trade in Tsingtau (*China*).—In the last normal year (1913) Tsingtau provided 40 per cent. of the total export of peanuts from China. The price at that time was about 0·7d. per lb. The price in November, 1916, was 1·3d. per lb. and by February, 1918, had risen to 2·6d. The total exports for the last two years were:—In shell—1916, 632,518 lb. 1917, 14,231 lb. Kernels—1916, 70,336,385 lb. 1917, 51,631,346 lb.

The last crop was not especially good owing to drought.—(*U.S. Com. Rep., Mar.* 16, 1918.)

COMPANY NEWS.

ANGLO-CONTINENTAL GUANO WORKS LTD.

The business of the company, which was established in 1873, was acquired from the Public Trustee as a going concern as from Dec. 31, 1915. The purchase consideration was £325,000, of which £100,000 was paid in cash, and the balance was to be payable in equal annual instalments of £50,000, first mortgage Debentures of £225,000 being issued to the Public Trustee as security.

The Report for the year ending Dec. 31 last, states that the whole of the debt has been discharged, and the debentures redeemed. The net profit was £37,267, and the distributable profits £65,777. Of this, £52,105 has been applied to dividend payments ($7\frac{1}{2}$ per cent. on the 100,000 cumulative preference shares, and $46\frac{1}{2}$ per cent. on the 1,000,000 ordinary shares (2s.), £8316 placed to a new reserve account (making a total reserve of £118,734), and £5356 carried forward.

Speaking at the first ordinary annual meeting in London on May 2, Mr. A. Mitchelson, chairman, said that imports of guano had been negligible since 1916, but the company had for many years sold large quantities of special manures, including superphosphates, bone-fertilisers, etc. In the past year the entire share capital of a well-known fertiliser business in the West of England had been taken over, and in view of this and other developments, new capital will be issued shortly.

NITROGEN PRODUCTS AND CARBIDE CO., LTD.

The fourth annual general meeting of this company was held on May 8 in London, Mr. A. E. Barton, the chairman, presiding.

In describing the company's activities during the past year, Mr. Barton said that the factory at Odde, Norway, did not maintain its maximum output continuously owing to lack of raw material, but the whole of the cyanamide produced was sold. Labour difficulties were experienced owing to the scarcity of food and the insistence of the Norwegian Government on the cultivation of an increased area of land. The works in Sweden ran uninterruptedly, and their output of carbide and cyanamide had been easily disposed of. The factories of the company's licensees in France had been in continuous operation manufacturing explosives for the French Government, and a factory in Italy would shortly begin work.

The ammonia supply for the works at Dagenham was formerly obtained from cyanamide from Odde, but owing to the shortage of supply, operations had to be suspended for a considerable time. Work has since been resumed with gas-liquor as raw material, in regard to which numerous difficulties had been encountered, but these were gradually being overcome. The profits earned would have been considerably greater if the cyanamide produced had been sold as a fertiliser instead of being used as a source of ammonia for war purposes.

The chairman then reviewed the past and the future of English agriculture and the prospects of the fertiliser trade in the light of the Report on the Post-war Position of Sulphuric Acid and the Fertiliser Trades (this J., 1918, 118 R) and emphasised the fact that the two chief artificial fertilisers now used, superphosphate and ammonium sulphate, both tended to give rise to acidity in the soil, and hence there would be great scope for a fertiliser like nitrolim which contains 40 per cent. of free lime. Rice and sugar cultivation in India could absorb almost unlimited amounts of this fertiliser, and a beet sugar industry in this country would provide a valuable outlet for it. He then alluded to the vital necessity for cheap electrical power in this country. Large-scale experiments made at their own works had shown that the production of such power and the processes of manufacture should be under one control. The works should be situated near the coalfield, the coal should be carbonised at a high temperature and the by-products recovered, the coke passed through producers, and the gases arising from the carbonisers and the producers used for firing boilers to work steam turbines operating large electrical generators. Such a scheme, including the purchase of a colliery, would entail a big capital expenditure, and would be difficult to carry out at present, but the company has made a start by preparing plans and estimates for a complete installation of 120,000 h.p.

The profit and loss account for the year ended June 30, 1917, gave a net profit of £212,881 on an issued capital of £1,808,554. £15,685 has been written off general expenditure account from the inception of the company to June 30, 1916, and £21,445 off preliminary expenses; £70,000 is placed to reserve for contingencies, and after paying a total of 6 per cent. for the year on the share capital, £24,049 is left to be carried forward.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, May 9 and 16.)

OPENINGS FOR BRITISH TRADE.

A firm of brokers and commission agents established in Durban and Johannesburg desires to obtain agencies for U.K. manufacturers of drugs, perfumery, chemicals, etc. [Ref. No. 125—151.]

A trade and insurance agent, importer and exporter, at Nicosia (Cyprus) wishes to establish agencies for U.K. manufacturers of chemicals, etc. [Ref. No. 129.]

TARIFF CUSTOMS EXCISE.

Argentina.—New regulations concerning the exportation of metals, etc., came into force on Feb. 28 last.

Australia.—The exportation of all animal fertilisers and superphosphates, except by consent of the Minister of State for Trade and Customs, is now prohibited.

Belgian Congo.—Valuations for the assessment of the export duty on palm oil, palm nuts, copper and tin ores, etc., may be inspected at the Board of Trade, Dept. of Overseas Trade.

British India.—A copy of the Notification containing "The Delhi Morphia Rules, 1918," which regulate the manufacture, sale, etc., of morphia drugs, may be inspected at the Board of Trade.

Canada.—By an Order in Council, the exportation of platinum is prohibited to all destinations outside of Canada, except under licence.

Ceylon.—Goods bearing the trade mark "Sanatogen" may no longer be imported, except under licence.

France.—The following substances are no longer included under the export prohibitions: citron juice, orange juice, citronelle and citrates.

Japan (Corea).—Certain clauses have been added to the Corean Customs Tariff Ordinance with the object of encouraging the iron industry. The Customs duty of 5 per cent. *ad val.* on imported coal has been rescinded.

Malay States (Perlis).—A number of import and export duties were imposed by a Resolution of the State Council on Jan. 14. Among the materials affected are: kerosene, tin ore, guano, fat and tallow, rubber, coconut products, and beeswax.

Mexico.—Among new tariff modifications taking effect from April 10, is the removal of import duty on aluminium intended exclusively for the treatment of ores.

New Zealand.—The exportation of glue pieces, hide pieces and trimmings and similar goods for the manufacture of glue and gelatine is prohibited, save with the consent of the Minister of Customs.

South Africa.—A new List of Decisions (No. 27) relating to the classification of imported dyes, stearic acid, tanning substances, etc., under the Customs Tariff has been issued.

United States.—Among the articles of which the importation from Europe is absolutely prohibited, are: lime, talc, soapstone, molybdenum, animal oils, aloxite, borocarbon, borax, chloride of lime, sodium cyanide, ferro-manganese and spiegeleisen, lead, magnesite, paraffin, and starch.

British Industries Fair (Glasgow), 1918.—The opening of the Fair has been fixed for August 19 and the closing for August 31 next. It is being organised by the Corporation of the City of Glasgow, and only British manufacturing firms will be permitted to exhibit. The Fair will include exhibits of Chemicals and Domestic Chemical Products, and Food Stuffs (prepared and preserved).

REVIEWS.

MONOGRAPHS ON BIOCHEMISTRY. LECITHIN AND ALLIED SUBSTANCES. THE LIPINS. *By* HUGH MACLEAN, M.D., D.Sc. *Pp.* 206. *(London: Longmans, Green and Co.) Price 7s. 6d. net.*

The series of monographs on biochemistry, the inception of which we owe to Dr. Plimmer and Professor Hopkins, have already proved of such great utility to chemical workers of all kinds that a warm welcome is ensured to the newest addition to their number. The subject selected by Dr. Maclean is one of such complexity that it is almost unknown to all but a few specialist workers in the field of biochemistry. None the less it is of the greatest importance for the full understanding of the difficult problems presented by vital changes. Any progress made by the chemical investigator is bound to be reflected in corresponding advances by the physician, as well as in the understanding of some of the most complex problems of nutrition, which latter subject is to-day undoubtedly of the utmost importance both to scientific workers, governments, and the community in general.

So little, indeed, is known about the lipins that the reviewer feels justified in attempting a brief account of these substances and the function they are considered to exercise in the animal and vegetable economy.

The ether or alcohol extract of animal or vegetable tissues is composed of a mass of substances which may be roughly classified as neutral fats or fatty acids; non-fatty substances such as cholesterol and certain pigments; substances containing the fatty acid radicals, nitrogen and phosphorus—the phosphatides; substances containing the fatty acids, nitrogen, and a carbohydrate group but no phosphorus—the cerebrosides. The monograph deals with the phosphatides and cerebrosides, for which the author introduces the class name of lipins.

The best known of the phosphatides is lecithin and the nearly related substance kephalin. Lecithin is a fat, that is a triglyceride, in which one of the three fatty acids is substituted by phosphoric acid combined with the base choline. The exact structure of lecithin is still shrouded in obscurity, owing to the difficulty in obtaining it free from other substances, particularly kephalin. The two fatty acids in its molecule are oleic and either palmitic or stearic. It probably contains a mixture of the unsymmetrical (α) and symmetrical (β) forms of glycero-phosphoric acid, many preparations of lecithin being optically active. The choline (*i.e.*, oxyethyl trimethyl ammonium hydroxide) is present in the form of an ester, being united to the phosphorus through the hydroxy group attached to carbon and not through that attached to nitrogen.

The allied kephalin molecule probably consists of glycerol and phosphoric acid, aminoethylalcohol, stearic and linolic acids. Both lecithin and kephalin are indefinite colloid substances; they form liquid crystals and are very labile in character, undergoing changes as the result of oxidation. In the tissues they probably exist in some kind of combination with protein.

In the animal the proportion of phosphatides is highest in the brain and in the spinal cord, and next largest in the heart, lungs and kidneys, but they appear to be present in every cell.

The two cerebrosides extracted from the brain are composed of a reducing sugar, invariably galactose, a base, sphingosine, and a fatty acid which is phrenosinic acid $C_{25}H_{50}O_3$ in the case of phrenosine and lignoceric acid $C_{24}H_{48}O_2$ in the case of kerasin. It is probable that the phrenosinic acid is the α-hydroxy derivative of next higher homologue of lignoceric acid; both acids are

normal straight chain compounds. Sphingosine $C_{17}H_{35}O_2N$ has the structure:—

$$CH_3(CH_2)_{11}\cdot CH : CH\cdot C_3H_4(OH)_2\ NH_2.$$

The actual part played by the lipins in the activity of the organism is still entirely unknown to us, but it will be of interest to allude to some of the hypotheses discussed by the author. It is, for instance, suggested that the lipins are the most labile of all the components of the colloidal systems which manifest the properties of living matter, and that they play an important rôle in the phenomena of metabolism. Apparently the degree of saturation of the fatty acids of the lipins can be influenced by the character of the diet, so that they play an important part in the history of fat metabolism. From the large proportion of lipin present in egg yolk it has been inferred that lecithin is a particularly suitable form of food for the developing animal. The beneficial effects of lecithin administered as food have been well established; it is said to produce an increase in body weight and generally to act as a stimulating agent to normal growth. It may be remarked that, contrary to the view prevailing up to 1911, the synthesis of the lipins can be effected in the organism even when only inorganic phosphates are supplied in the food. It was at one time thought that the vitamines or specific substances which are absolutely necessary for the production of growth in young animals were associated with lipins, but this has been disproved by the observation that the essential constituent for growth is still contained in purified butter fat, which was entirely free from lipins. Certain of the ductless glands contain a high proportion of lipins compared with tissues, such as muscle fibre.

As already indicated, the greatest confusion exists in this branch of chemistry, and Dr. Maclean finds it necessary to devote sections to protagon and a number of alleged lipins in which all the existing information is critically surveyed. The monograph will be indispensable to all future workers on the subject and should do much indeed to stimulate further investigation. Like the other monographs of the series, it contains a very full bibliography arranged in order of authors' names.

The author closes his preface with a graceful appreciation of the experimental work done by Thudichum over twenty years ago, and shows that recent advances are in many cases but corroborations of Thudichum's work, which met with much adverse criticism at the time. This criticism was resented vigorously by Thudichum, particularly in connexion with his conclusion that protagon had no claims to be considered as a chemical unit, but he has since proved to be entirely justified, and his original work has been largely overlooked by subsequent investigators on the Continent, who have re-published the same facts as new observations. This is the common experience of many English workers, and it is to be hoped that the good example set by Dr. Maclean in honouring the real pioneers will be more generally followed.

E. F. Armstrong.

The Manufacture of Sulphate of Ammonia. *By* G. T. Calvert. *Second Edition. Pp.* 153. (*London: Benn Bros., Ltd.*) *Price: 7s. 6d. net.*

This book, which does not claim to be "so much the work of a scientist as that of a practical works' man writing for his fellow workers," deals essentially with the practical aspect of the manufacture of sulphate of ammonia. The author sets out not only to give a general survey of the various processes involved, and the plants employed in this manufacture, but to deal in considerable detail with the difficulties most frequently encountered in the practical management of a sulphate of ammonia house. Excellent instructions are given on the starting, working, and shutting down of the plant, and many useful hints are imparted, which only technical workers can fully appreciate.

The arrangement and treatment of the subject is well proportioned and systematic. The introductory chapters are devoted to the chemical control of the manufacture, simple methods of analysis of raw materials, finished products and spent liquor being described in some detail, whilst analytical data are furnished in the appendix. The subject of the supply and preheating of ammoniacal liquor receives some attention, but it is surprising to note that although the necessity of covering liquor storage tanks to prevent loss of ammonia is emphasised, no mention is made of provision for scrubbing the displaced air when the tank is filled—a practice which works' experience has shown to be very desirable.

A general survey is next given of the various types of stills in use, the apparatus required for securing an adequate supply of milk of lime to the stills, and the construction and practical working of ejector discharge and bottom discharge saturators. The descriptions of various types of apparatus together with their comparative advantages and disadvantages are well set out, and the numerous diagrams undoubtedly enhance their value; we fail, however, to notice any indication of the outputs to be expected from the several types of plant.

In the chapters dealing with the extraction and drying of the salt, the practice now adopted in many large works of separating mother liquor and salt in a hydro-extractor without the intermediate use of a draining table has escaped mention, and in the part dealing with the concentration of crude liquor, no consideration has been given to the removal of sulphuretted hydrogen, a recent development of no small interest to manufacturers of sulphate of ammonia. Apart from certain, but not unimportant, omissions of this kind, the book has distinct merits, and although it is intended primarily for the technical worker, it should also prove of interest and value to the student and to those who work in allied branches of chemistry.

H. Hollings.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.2.* [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

NATURAL SCIENCE IN EDUCATION.

The recently issued Report of the Committee on the Position of Natural Science in the Educational System of Great Britain,* presided over by Sir J. J. Thomson, deserves the attention of our readers, not only on general national grounds, but also because in one or two passages there is reference more especially to matters affecting the interests of chemical industry.

Perhaps the most far-reaching conclusion drawn by the Committee is that instruction in natural science should form a regular part of the general course of education up to the age of about 16. Suggestions are made as to the scope of such instruction, more particularly in public and other secondary schools, and it is recommended that science work for pupils between the ages of 12 and 16 should include physics, chemistry, and some study of plant and animal life, efforts being made to secure as close a correlation as possible between mathematics and science at all stages, and to emphasise those aspects of the sciences which have a direct bearing on everyday objects and experience. It is intended that the tests applied at the close of the course of general education up to 16, in the form of a first school examination, shall be the normal qualification for entrance to the universities and professions.

The Report deals at considerable length with the character and scope of the science work which should be carried out at secondary schools, subsequent to the passing of the first school examination, by pupils of 16—18 who look forward to such occupations as medicine, pharmacy, agriculture, and chemical industry. In connexion with the last-mentioned, the Committee has consulted a number of chemical manufacturers, inviting opinions as to the training provided in existing educational institutions for those who are to become associated with technical chemistry in one capacity or another. The replies received from sixteen representative firms indicate a prevailing opinion that special training is most suitably given at the works, and that the time needed before a man becomes of use to his employer can best be shortened by the provision of a thorough general chemical training as a foundation. The Committee's conclusion is that the science work of a secondary school boy proceeding to a university or technical college with the view of entering chemical industry need not differ from that of the pupils who make the physical sciences their chief aim, except perhaps in respect to instruction in technical drawing, the special value of which to such a boy is clearly recognised and emphasised.

The university training of the chemical technologist also comes under review, and the opinion is expressed that students of technical chemistry should have an opportunity of becoming acquainted with the plant and methods employed generally in large scale chemical operations. An additional year of study would probably be required for this purpose. Whilst the necessity of co-operation between the chemist and the engineer is recognised, the attempt to give anything like full professional qualifications in the two subjects within the time limits of an ordinary degree course is not regarded with favour.

The Report naturally urges the advantage of research experience for those who are to be engaged in the application of science to industry, and emphasises the share which research work has in developing independence of thought, judgment, and self-reliance. Unfortunately many promising men, who would benefit enormously by a year or two years of post-graduate research, are faced by difficulties of a purely financial kind, and find themselves compelled to take up remunerative work without delay. With this in view, the Committee presses strongly for the more generous provision of post-graduate scholarships, maintaining that no other expenditure of public money on scholarships promises so valuable a return.

It must be borne in mind that chemical industry requires a supply not only of highly-trained men as research chemists and works managers, but also of others who may be classified as junior assistants or works chemists. The facts laid before the Committee showed that junior assistants are recruited from the technical schools and to a small extent from the secondary schools, while works chemists are obtained largely from the technical colleges. The Committee has considered the education of the lad who passes straight from school into industry, and recommends that junior technical schools should be strengthened and developed, being regarded as specialised secondary schools, where a foreign language is not compulsory, and where a definite bias is given towards practical vocational education in connexion with science, more especially in relation to local industries. Naturally the training of those lads of 14—16 who look forward to employment in chemical industry will be notably affected by the provisions of the Education Bill now before Parliament.

The Report abounds in other interesting points, which may not have such direct significance for chemical industry, but must appeal to all who have at heart the education of our people generally to a better appreciation of what science can do for national prosperity and development. Those who desire to advocate the necessary reforms urged by the Committee cannot do better than familiarise themselves with the facts and arguments embodied in the Report.

* [Cd. 9011.] Price 9*d*. net. London: H.M. Stationery Office.

ZIRCONIA AS A REFRACTORY.

E. H. RODD.

One of the most difficult problems associated with all high-temperature work, whether in the laboratory or the factory, is the provision of suitable refractory materials which will both withstand high temperatures and at the same time resist the chemical action of molten materials and of gases. In fact, the limit of high temperature attainment is set by the limit of endurance of the refractory. All the best known refractories, fireclay, magnesite, silica, carbon or graphite, have serious limitations, thermal or chemical, and it is of the greatest importance to our industries that any possible new refractory should be given the closest study. Zirconia has long been known as an oxide of great chemical stability and resistance to heat, but only within the last few years has its employment as a refractory material come within the range of commercial possibilities. Formerly known only in the combined state in the form of zircon, a widely but sparsely distributed zirconium silicate, and in a few other rare minerals, large deposits of the oxide have lately been discovered in Brazil.

A short account of these deposits may be of interest to the reader. They are situated in the Caldas region, some 130 miles north of S. Paulo city, and cover an extensive mountainous plateau, about 30 miles long and 15 miles wide. The mineral, known as zirkite to distinguish it from another Brazilian ZrO_2 mineral, baddeleyite, occurs in two

forms, firstly as alluvial pebbles ½ to 3 in. in diameter, known as "favas," containing 90—93% ZrO_2, and secondly in the form of hard masses of light grey to blue-black ore, carrying 73—85% ZrO_2. On closer inspection, the zirkite appears to contain three distinct minerals, the oxide brazilite constituting the main bulk, with smaller quantities of zircon and a second unnamed silicate. (See H. E. Meyer, Wileman's Brazilian Review, 1916, p. 826.) The deposits, which are at present difficult of access, are being worked by the Foote Mineral Co. of Philadelphia, which advertises a material containing 80% ZrO_2 at about 30*l*. per ton, a price which may be expected to come down considerably in the near future. No reliable estimate of the quantity of material contained in these deposits is yet available, but there appears to be no fear of their being soon exhausted however surprisingly the demand may grow. Already before the war large quantities of the zirconia appear to have been exported to Germany, where much research on its utilisation has been carried out.

Before the possible applications of this material as a refractory are discussed, the properties of pure zirconia, ZrO_2, must first be considered. Zirconia is one of the most refractory oxides known, its fusing point being in the neighbourhood of 3000° C. Even when containing about 1·25% of silica and ferric oxide it does not melt below 2560° C. The thermal conductivity of the pure fused material is very low, and it has a very low coefficient of expansion, $8{\cdot}4 \times 10^{-7}$, which compares very favourably with that of carborundum ($6{\cdot}58 \times 10^{-6}$) or alundum ($7{\cdot}1 \times 10^{-6}$). Such a substance can clearly withstand sudden changes of temperature without fear of fracturing. Chemically, zirconia is extremely inert, being highly resistant to acids, fused alkalies, fused quartz or molten glass. No other material known to the chemist possesses such a combination of desirable refractory properties. These very properties have so far hindered its immediate development on account of the difficulties encountered in working such a material. These difficulties, however, are being slowly surmounted. One undesirable property of zirconia must here be mentioned, namely its tendency under certain conditions at high temperatures, in the presence of nitrogen or carbon, to become converted into nitride or carbide.

The utilisation of zirconia as a refractory can be regarded from two points of view, that of the laboratory and that of the works, and further it is necessary to consider, especially from the industrial standpoint, whether the crude material can be used or whether any purification is essential. For experimental purposes in the laboratory the question of cost can be left out of consideration, the desideratum being the purest and most resistant material, thermally, physically, and chemically, which can be obtained. The question to be decided is whether zirconia can be used for the construction of apparatus superior for certain purposes to that already available.

When we come to consider the materials available for the construction of such articles as crucibles, gas-muffles, and all gas-fired furnaces, tubes for electric resistance furnaces, arc furnaces and the like, the range is found to be very limited. Apart from platinum and tungsten, suitable only for small crucibles, etc., and porcelain, the use of which is limited by the softening temperature of the glaze, we have fire-clay, various graphite-clay mixtures, fused silica, magnesite, alundum, graphite, compressed carbon, carborundum, and very few other materials All these have serious limitations from which zirconia does not suffer. Zirconia is more infusible than the best of them, is not affected by an oxidising atmosphere as are graphite and carbon, is not attacked by alkalis as is fused silica, nor by acids, as are magnesite and alundum, and is resistant to fluxing, although, of course, at very high temperatures it is readily fluxed by an oxide like magnesia. There is no question that zirconia crucibles, for example, would be superior for many purposes to any of those now obtainable, and on account of its low thermal conductivity it would contribute greatly to the efficiency of furnaces of all types if used as a lining.

The early attempts in Germany to make satisfactory zirconia ware were not so successful as was anticipated, the finished articles frequently developing cracks. This fault was due to the extremely high firing temperature required to get a fully shrunk body and to the difficulty experienced in finding a suitable binder. The publication of numerous papers on the subject within the last three years shows that the Germans are still persevering with their experiments; doubtless they still hope to have access to the Brazilian raw material after the war. They have a shrewd conviction that the importance of zirconia is going to increase.

Crucibles of zirconia appeared in Germany some years ago. Their use for melting quartz was patented by Heraeus in 1906 (D.R.P. 179,570), and according to Riecke (Z. angew. Chem., **1910**, **23**, 1019) they had been for some time made by the Kgl. Porzellan-manufaktur, Berlin, starch and wheatmeal being the binders employed, the crucibles being fired in a porcelain kiln at 1450° C. It is clear that pure zirconia cannot have been used for the crucibles, as this will not frit at anything like so low a temperature. Unfortunately specimens of these crucibles are not procurable for examination. The fact that manufacturers were able to produce these crucibles whilst the chemists, according to their published accounts, failed to produce satisfactory articles, indicates that the solution of such a problem demands in addition to scientific knowledge the skill and technique of the trained potter. The chemical work which has been published is, however, of considerable interest. Bayer (Z. angew. Chem., 1910, p. 485) purified crude zirconia by extraction with hydrochloric acid, and to render this material plastic added 5 per cent. of pure zirconium hydroxide with starch solution as a binder. The carefully dried moulded crucibles were fired in a Hempel resistance furnace at 2000° and very hard crucibles were said to have been obtained. Ruff (Z. anorg. Chem., **1914**, **86**, 389) found that the addition of 3 per cent. of magnesia to pure zirconia greatly increased the strength of zirconia pots, besides reducing the shrinkage temperature to about 1450° C. Using 6 per cent. borax he obtained vessels showing great strength right up to the fusing point, but the shrinkage temperature was high, and even after firing at 2200—2400° C. the pots were porous. Weiss (Z. anorg. Chem., **1910**, **65**, 220) used up to 10 per cent. magnesium oxide, with phosphoric acid as a binder. He found that his pots needed to be dried very slowly after moulding, or they were almost certain to crack during firing. Many other admixtures such as plastic clay, cryolite and fluorspar were tried by Ruff but were found to be unsatisfactory. Pots containing clay lose shape and blister badly at 1900° C. owing to decomposition of the clay, a very undesirable property. The same worker (*l.c.* 1916, **97**, **73**) investigated the effect of adding certain other oxides to zirconia in small amounts, in particular some of the rare earths. The addition of 1 per cent. of alumina gave good results with a firing temperature of 2000° C., whilst with 1 per cent. thoria 2200° C. was attained, and with 1—3 per cent. of yttria 2400° C. The most promising results are obtained, however, if the zirconia is first fused. Pure zirconia, made *e.g.* by ignition of a basic sulphate, forms a very loose powder, and articles made from this shrink enormously when fired. The oxide can be fused in an arc furnace to a compact, extremely hard mass, very difficult to grind, but articles made up from the ground material practically do not

shrink at all, and consequently are not likely to crack. **Podszus** (Z. angew. Chem., 1917, 30, i, 17-19) claims to have made very successful porcelain-like ware with this fused material. Perhaps his most interesting claim is for a furnace made of this fused oxide in which, firing with gas and oxygen, temperatures of 2400—2500° C. were obtained. This is a startling achievement for a gas-fired furnace, and the development of such a furnace would practically solve the problem of firing zirconia ware.

The above brief remarks indicate the possibility that we may hope soon to have zirconia laboratory apparatus as superior to fused silica ware as the latter is to glass ware. Whether zirconia can also be introduced as a refractory on the large scale depends upon considerations of expense. If the increased cost of the new refractory is balanced by greater length of life, more continuous working and less loss of time and expenditure of labour for repairs, the success of zirconia is assured. The refractory properties of the crude material as it comes on the market are very high, although of course inferior to those of pure zirconia. It is supplied as a heavy reddish-brown powder, density 4·4—5·3, most of which will pass through a 90-mesh sieve. According to an analysis by Wedekind (Ber. deutsch. Chem., 1910, **43**, 291) it contains about 68·9% ZrO_2, 14·08% $ZrSiO_4$, 12·22% SiO_2, 3·6% Fe_2O_3, 0·6% TiO_2, and some more recent analyses by the writer gave almost identical results. This crude material could undoubtedly find many useful applications, especially where the presence of so much iron is of no consequence. The choice of a suitable binding material is of first importance, since it is necessary to bring about fritting at only a moderately high temperature, without unduly reducing the refractoriness. It is said to have been used very successfully as a lining for Siemens Martin steel furnaces, water-free tar being used as a binder. Owing to the long life of such linings the cost of maintenance is very low. The zirconia can also be made up into bricks of great hardness and strength, so that for some purposes it may perhaps take the place of silica bricks, which are very brittle and frequently give trouble. The zirconia bricks, however, need a high firing temperature. Some such bricks, of which the writer has had experience, seemed to have been seriously underfired.

There are many other directions in which zirconia may find application. The recent astonishing development of electric furnaces for metallurgical processes has brought the question of refractories into prominence, and in this connexion zirconia may fulfil all requirements. In the pottery and glass industries, too, there are probably many purposes for which a better refractory is desirable. Obviously there is scope here for much research, of a kind which should be taken up by the Committee for Scientific and Industrial Research, and this, we believe, is actually being done. Doubtless, too, enterprising manufacturers and users of refractories will, when the desirable properties of zirconia become known to them, carry out experiments with it on their own account.

For some industrial purposes a purer zirconia, in particular one free from iron, is likely to be required. For example, in the manufacture of glass, and especially optical glass, it is essential that the material of which the pots are composed shall not contain iron which may be dissolved out by the melt. The separation of iron from zirconia is a task of no small difficulty, and it is fairly certain that iron-free zirconia will be available only for special purposes on a large scale. Experiments made by the writer showed that rather more than half the iron in the crude zirconia can be removed by treatment with acids. A complete separation from iron and other impurities can only be obtained by bringing the whole into solution, *e.g.*, by means of hydrofluoric acid, and treating the resulting solution by special methods. A process which was worked out and patented (Eng. Pat. Appl. **1440**, 1917) consisted in precipitating a basic sulphate free from iron by partial neutralisation of a sulphuric acid solution with ammonia. An interesting outcome of this work was the discovery of a new series of basic zirconium salts, which bring out in a striking manner the analogy between zirconium and tin. (Chem. Soc. Trans., 1917, 111, 396, and Chem. Soc. Ann. Report, 1917, p. 50.) Other processes for separating zirconia from iron have been patented, *e.g.*, in Eng. Pat. 9153, 1913, a neutral solution of mixed chlorides or sulphates is heated under pressure, when the zirconium salt is hydrolysed and precipitated as hydrated oxide, iron, aluminium, etc., remaining in solution. The hydrate or basic salt thus prepared can be ignited to oxide and afterwards fused or treated in any desired manner. The purified zirconia will be needed for such purposes as laboratory apparatus, for use in enamels, into the composition of which zirconia is being introduced, and perhaps for certain special industrial purposes.

The writer concludes with the hope that this short account may serve a useful purpose in bringing to the notice of those interested in refractories a material which has hitherto received little attention in this country, but which deserves the most careful consideration.

"TEXTILE TECHNOLOGY—AN EXACT SCIENCE"

J. F. BRIGGS.

The subject of the presidential address delivered recently by Mr. C. F. Cross to the Society of Dyers and Colourists was eminently suited to a mind teeming with intuitive inspiration, and those who know and admire the new President's imaginative genius and artistic temperament will readily understand that the presentment of his thesis was a labour of love rather than a duty to be performed. The title of the President's remarks is perhaps hardly an adequate description of his point of view, and it should rather have read "Textile Technology—a Branch of Natural Philosophy." As an exact science, strictly mathematical in treatment, textile mechanics and designing has existed in a high state of development for a long time. What Mr. Cross now wishes to draw attention to is the need for the highest intellects in physical and chemical science to study the problems of structure and constitution involved in those products which are the outward and visible expression of that highly sensitive and fertile balance of forces which we call vital energy. The products of these organised synthetic forces form the groundwork for the building up of a new order of physics and chemistry in which lies hidden the key to secrets of Nature as yet unexplored. The study of the physics and chemistry of the colloidal state, which has attracted so many investigators in recent years to formerly unsuspected phases of inorganic matter, has as yet done little more than touch the fringe of the great domain of organised colloids which form the materials and products of Nature's laboratory. Of a similarly preliminary order is the science of organic chemistry—so-called—that great German god which deals with the dead excreta and by-products of the real organic world: as Mr. Cross says: "There is also a more subtle chemistry than is expounded in Beilstein."

The future lies with the type of intellect which can see furthest through a brick wall, and that assuredly is not the German. The present war is completing the break-away from the German obsession which laid so firm a grip on our scientific life in the latter part of the last century and which, though good as disciplinary training, tended to deaden the soul and to convert so many of our leading Academicians into clever teachers of laboratory gymnastics. As I understand it, Mr. Cross' call is in the first place to the Academicians—"Back to Nature!"—armed with all modern improvements in means and methods and animated by the spirit of the old investigators. The movement is already on its way; there exist certain primary, "key" values or interests which have been manipulated by the "practical" man before either chemistry or history began: Agriculture, metallurgy, fermentation, textiles. These all claim their places in the new order of physics and chemistry which is unfolding itself in the present century. The textile field demands workers, and they will be amply repaid. The organic colloid, as visualised by Mr. Cross, is not merely the reagent and the product of reaction, but, in its living state, actually the laboratory of Nature's chemical handiwork. Here all the atomic groups, ions, and functions are in a state of flux, of ordered disorderliness, and take a finite form only when crystalloids are turned out ("extruded") as temporarily done with in any particular cycle of changes. The substratum survives the play of vital forces, preserving many of the fluid properties impressed on it by its life history. Thus the old conceptions of constitutional molecular structure lose their significance; the production of dextrose from cellulose, for instance, does not imply the presence of preformed dextrose groupings, but is merely one of the paths by which the labile groups or functions may be thrown out and polarised in a comparatively non-labile form. The ions of the colloid aggregate may in their ultimate dimensions be much simpler than the molecular form which they take up in passing to more rigid products, and what we have hitherto regarded as fission may in reality be synthesis. In addition to the problems of minute, *i.e.* molecular, configuration, many of which may be formulated in general terms common to all organic colloids, the textile materials offer scope for investigation from the point of view of their gross structure, on the one hand in relation to their industrial properties, and on the other in the manner in which the gross structure is determined by the chemical and molecular influences of the minute.

Research in Applied Chemistry.—The Mellon Institute of Industrial Research was established in Pittsburgh, Pennsylvania, in connexion with the university of that city, in 1911. In the seven years that have elapsed 75 firms have endowed 189 one-year fellowships for the study of manufacturing problems, chiefly of a chemical nature. During the past year 21 members of the staff have entered the Government service (making 28 in all), in addition to the war work carried on at the Institute. The director, Dr. Bacon, is lieutenant-colonel on General Pershing's staff, and the assistant director, Major Hamor, is with him. There are at present 42 fellowships established, engaging 64 fellows, and the active professional staff of administrators and assistant fellows numbers 110.

With a view to organising a central bureau of industrial research, the National Association of Cotton Manufacturers of the United States is sending a questionnaire to each member. It has also been proposed that a minimum standard of housing and living conditions for employees be established as a condition of membership.

THE OLD AND NEW MINERALOGY.

Abstract of the Hugo Müller Lecture, delivered before the Chemical Society on April 18, 1918, by Sir H. A. Miers.

The old mineralogy was the "natural system" of Werner of Freiberg, developed and elaborated by Mohs, who claimed that "mineralogy is the natural history of minerals," and consequently based the science on the study of external properties only, such as specific gravity, lustre, hardness, frangibility, and crystalline form. Chemical properties, being internal, were ignored on principle.

The revolt against the old mineralogy occurred in Müller's student days. J. D. Dana, in the 3rd edition of his "System of Mineralogy," repudiated the natural-history system and adopted a chemical classification of minerals. C. F. Rammelsberg and Gustav Rose advanced the chemical method of study, and Naumann, in his "Elements of Mineralogy," 1846-1859, also adopted a chemical system of classification.

The contrast between the two schools is seen in the attitudes of Mohs and Haüy. According to Mohs, "Natural History considers the natural products as they are, and not as they have been formed"; consequently mineralogy is not to be intermingled with chemistry and geology, and these sciences must be kept perfectly distinct from each other. Haüy, on the other hand, who did much to advance chemical crystallography, believed in co-operation between the sciences, including not only chemistry, but physics and geology. Mohs was guilty of the worst type of specialisation because he failed to recognise that advances take place along the border lines between the sciences.

The new mineralogy includes the study of minerals before and after solidification. The investigation of the formation of the Stassfurt minerals by van't Hoff, and the work of the Washington geophysicists on the solidification of eutectic mixtures and on enantiotropic minerals, are conspicuous examples of the new science.

The study of minerals after solidification has been advanced by Becke's conception of topic axes, which has been employed by Muthmann and Tutton, by Barker in his work on the molecular volumes of crystals, and by Sollas on specific refractive energy. The view has now been reached that the molecule in a crystal is a geometrical fiction, and that it is unnecessary to assume molecular as distinct from atomic forces. The theory of Barlow and Pope is a bold and original attempt to solve the supreme problem of crystallography, i.e. to deduce the physical form and properties of a crystal from its chemical composition; whilst the X-ray methods of the Braggs seem to have provided direct evidence of the arrangement and spacing of the atoms in a crystal. Lastly, the past history of minerals has been illuminated by the study of radioactivity, and by synthetic work on silicates.

The difference between the old and the new mineralogy may be thus expressed: the old mineralogy inquired how minerals were related to each other, as if mineral species were evolved from one another; the new mineralogy inquires why the elements have come together and how they are united to form minerals. This change of outlook is due to the application to minerals of every new experimental method, whether physical or chemical, that can be employed. The physical investigation of solutions, X-ray analysis, and the study of radioactive change are examples of the methods used.

The fascination of minerals makes a strong appeal to young minds; and the pursuit of natural history, of which mineralogy is a branch, may do much to establish science in the place it should occupy in our educational system.

MEETINGS OF OTHER SOCIETIES.

THE FARADAY SOCIETY.

A general discussion on "The Co-ordination of Scientific Publication," opened by the President, Sir Robert Hadfield, was held on May 7 at the rooms of the Chemical Society. Among those who took part were several presidents and secretaries of some of the principal London scientific societies, and the editors of some of the leading technical journals. The discussion covered a very wide field, and not only were many very practical suggestions put forward, but a favourable opinion was expressed in regard to the really big schemes that have been advanced from time to time—opinion which will be helpful in bringing them to fruition.

Only one statement is necessary to bring home the necessity for action. There are 601 learned societies in the United Kingdom, and 1400 important periodicals in London libraries. With an inevitable advance in specialisation the number of societies and journals will assuredly increase, and the problem is how to ensure accessibility to the investigator and the scientific worker of the ever-growing mass of knowledge. The proposals made can be classified conveniently as follows:

I. *Co-ordination in the reading of papers.*

(*a*) Submission of all papers to a central body for allocation among the societies.

This was not favourably received, the objection being that it would tend to stifle the individuality of the societies.

(*b*) An extension of joint meetings, especially when papers covering the spheres of two or more societies are to be considered.

(*c*) The weekly publication by a body like the Central Board of Scientific Societies of a list of all papers to be read.

(*d*) Free admission of members of the important societies to meetings of any society.

(*e*) Conferences between the officials of cognate societies when programmes are being drawn up to prevent overlapping and to ensure co-ordination.

II. *Co-ordination in the publication of papers.*

(*a*) Standardisation in type and in size of journals of the societies.

This proposal was very generally approved.

(*b*) An extension of the practice of publishing reprints of papers and selling them at a nominal price.

(*c*) All publications to be undertaken by a central body, which should publish papers grouped into sections, the societies subscribing for the group or groups in which they were interested.

(*d*) The establishment of more technical journals of a high standard, to keep people in general touch with scientific advances.

(*e*) The organised publication by a central body, or a department—like the Department of Scientific and Industrial Research—of monographs describing the state of knowledge in the various sub-branches of science.

(*f*) All published work on any one subject to be issued weekly in one journal, which should include both pure and applied science.

III. *Centralisation of Abstracting and Indexing.*

(*a*) One central body only, such as the Conjoint Board, to undertake the publication of abstracts and to sell them at cost in sections to members of the affiliated societies.

(*b*) Abstracting to be internationalised, each country being responsible for abstracting its own work and for translating abstracts supplied by the foreign centres.

(*c*) Societies to group themselves together for the purpose of abstracting.

IV. *Co-operation between the societies and their libraries.*

(*a*) The societies to be federated into groups, physical, chemical, engineering with its sub-groups, each group being housed in a common building, with a complete library devoted to the particular branch of science represented by the group. The libraries could be connected with one another by private telephones.

(*b*) The principal societies to have provincial branches, which should federate and be housed in one building in every important town.

(*c*) Closer co-operation or federation between existing London and provincial societies.

(*d*) The erection of one great central building and library in London for all the principal societies and their books, on the pattern of the Central Engineering Building endowed by Mr. Carnegie in New York. Among the functions of such a library would be:

(1) To issue a complete card-index of all published works, which could be repeated for the chief provincial centres and be available in sections for any one who desired particular references.

(2) To have a trained staff ready to supply information or references on any branch of work. As a preliminary step it would be necessary to create a College of Librarians, or Schools of Library Science.

(*e*) A Secretary of Secretaries, with perhaps a special President or Council, should be appointed to act as the medium for co-ordination between the societies.

THE CERAMIC SOCIETY.

The fourth meeting of the Refractory Materials Section was held on May 14 and 15 at Sheffield, under the chairmanship of Mr. W. J. Jones, of the Ministry of Munitions.

After papers, mainly of local interest, on "Native Supplies of Refractory Materials Available in the Sheffield District," and "Notes on the Evolution of the Ganister Industry in the Sheffield District," by Prof. W. G. Fearnsides and J. Holland respectively, had been read, Dr. A. Scott contributed papers on "Constitution of Silica Bricks" and "A Micro-study of Magnesite Bricks." In the first of these the author emphasised the importance of the rate at which quartz is converted into the high temperature forms, cristobalite and tridymite, this conversion depending on such considerations as grain size, amount and distribution of cementing material, and the nature of the added bond. The course of the conversion depends on the quartz being dissolved in the calcium silicate matrix, and the silica being reprecipitated as cristobalite. Bricks from the ports of furnaces showed large development of fayalite; in roof bricks the iron present is mainly in the form of oxides. Two types of crystallisation of magnesia have been observed in magnesite bricks; in one, periclase forms a reticulate mass of polygonal crystals with inclusions of the spinel mineral magnesioferrite, and in the other, the periclase is in the form of rounded anhedral grains set in a matrix generally crystalline but occasionally glassy. In the former various minerals develop, *viz.*, forsterite, monticellite, and an unidentified mineral resembling quartz but with lower refractive index.

In a paper on "The Essential Properties of Refractories used in Steel Production," Mr. A. Reynolds contended that the best deoxidising agent must be the substance which formed the first slag in the Bessemer converter, and the worst that which formed the last, and that the proper sequence

of separate stages of steel refinement must be the sequence of reactions in the converter. At low temperature the order of oxidation is silico-manganese, silico-iron, carbon, phosphorus; at high temperature, silico-iron is not only not attacked, but it is formed, and the sequence is silico-manganese, carbon, phosphorus. In the basic process where phosphatic slags may occur as well as silicates, the carbon reaction merely requires high temperature, and is independent of the phosphorus reaction, though mass action, of course, has influence.

The author insists that the fourth process must be a treatment by silico-manganese. He maintains that, at low temperatures, FeSi and FeO react, and that at high temperatures these substances are *produced*. Slightly basic monosilicate of manganese is exceptionally stable and its heat of formation is comparatively high. Electrically produced silico-manganese is almost free from carbide, and the commercial product has an average content of about 31% Si and 63% Mn. The production of steel low in oxygen is always due to silico-manganese, and the best steel makers add it, instead of awaiting its formation from silicide of iron and carbide of manganese. The author is firmly convinced that in the final treatment, the steel should never be allowed to come into contact with acid material, as silica oxidises the iron. What is needed is perhaps a neutral silicate of alumina, or, if it can be produced, silicate of magnesia would probably be an ideal material.

Two papers by Dr. A. Bigot dealt with "Silica Products, I. Raw Materials," and "Corindite" respectively. Quartz and calcined flint were found to contain little foreign matter, whereas the quartzites tested contained about 7 per cent. of clay. From the analyses and tests the author concludes that most quartzites contain calcareous clay in varying amounts, and that this serves as a bond in the manufacture of silica bricks. When the quartzites are rich in clay and well ground, the quantity of lime added can be much reduced. If the rocks used, such as quartz or flint, do not contain free clay, and after grinding contain 20 per cent. of material passing the 200 sieve, 2 to 3 per cent. of aluminous clay can be added with the proper quantity of lime.

The rocks suitable for making silica bricks include (1) certain quartzites and quartzose sandstones which, after heating to 1710° for 1 hour and cooling for 2—3 hours before drawing from the furnaces, remain compact, preserve their shapes, and show only a few cracks; (2) quartz and quartzose rocks which split into compact and tough pieces of moderate size; and (3) flint which breaks up into pieces of comparatively large size. Reference was also made to determination of expansion, density and porosity of materials heated at 1400°, 1560°, and 1710° C. respectively. Samples of flint and quartz showed less expansion and less porosity than quartzites, nevertheless quartzites are better suited for making silica bricks because of the clay which they contain.

Microscopic study reveals the arrangement of crystals and argillaceous amorphous material, and the conversion of quartz into cristobalite and tridymite, as well as the presence and distribution of cracks. "Corindite" is a refractory and abrasive substance obtained cheaply by heating a mixture of bauxite and anthracite in a cupola furnace with the aid of air-blast. Aluminium carbide is formed, and by further action is transformed almost entirely into alumina. The resulting vesicular fused block of "corindite" contains innumerable small crystals of alumina.

Corindite products which are suitable for rotary cement kilns, gas and heavy oil ovens, coke ovens, etc., have three outstanding properties. (1) Very high refractoriness, the melting points being higher than that of the bauxite from which they are made. This is due to the iron in the corindite being almost exclusively in the form of ferrous oxide combined with alumina as $Al_2O_3 \cdot FeO$. (2) The variation of volume up to 1750° C. is almost inappreciable. (3) Very great resistance to wear.

Red fused bauxite has a composition not very different from that of emery, and is more refractory and also superior as an abrasive.

Mr. E. Steiger described a modified shaft-kiln, designed for the dead burning of magnesite and dolomite and the burning of cement, for which economy of fuel and increased efficiency are claimed. At the bottom of the kiln is a rotator consisting of a vertical shaft carrying a rotating conical cast-steel head with ribs on its upper surface. The rotary action moves the finished material towards the opening, tends to grind any lumps of calcined material, and keeps the column in constant motion.

Mr. H. V. Thompson described experiments bearing on the "Dissociation of Salt." It was found that water vapour carried by a current of air over molten salt produced hydrolysis. A current of air carrying water and salt vapour was found to act on quartz, ferric oxide, alumina, and clays. In the case of quartz an insoluble sodium silicate approximately to the formula $Na_2O \cdot SiO_2$ was formed, the insolubility being due apparently to the high temperature, much in the same way as strongly ignited alumina or ferric oxide is insoluble in hydrochloric acid. There was much less action on quartz when water vapour was absent. In the case of alumina the product had a composition indicating the possibility of the formation of a sodium aluminate of the empirical composition $9Na_2O \cdot 2Al_2O_3$. Clays gave a more marked reaction, which was not studied closely, though increase in iron content seemed to be associated with greater action.

Mr J. P. Leather's paper on "Refractory Materials in Gasworks, from a User's Point of View," was mainly a discussion of the more desirable properties in such refractory materials, and the report of the Committee presented by Dr. J. W. Mellor on "The Standardisation of Tests for Refractory Materials (Part I.)" contained detailed instructions for carrying out various physical and chemical tests.

The remainder of the proceedings included a "Note on Electric Furnace Treatment of Refractories," by Dr. R. S. Hutton; "A Note on a Fire-brick from the Crown of an Electric Steel Furnace," by W. J. Rees; and a popular evening lecture by Mr. Cosmo Johns, entitled "Science and the Practical Man."

SOCIETY OF GLASS TECHNOLOGY.

At the meeting held at the Institute of Chemistry, London, on May 15, the President, Mr. W. F. J. Wood, opened a discussion on "The Glass Industry after the War." He advocated the formation of a Trade Council in each of the eight main sections into which the industry could be divided, and also a Federation of these Councils; each section should elect four members, two manufacturers and two workmen, and in addition there should be four scientific representatives, six Government representatives, and two representatives of finance. The sections should take steps to organise as quickly as possible, workmen should be encouraged, and the best machines available should be introduced, so that the country could make all its own glass instead of some 20 per cent. as in pre-war days. Some kind of Government assistance must be given to the glass industry. A strong case for protection in some branches and prohibition in others could be made out; failing this there would be a deluge of foreign glass after the war, just when our furnaces and shops ought

to be undergoing repairs, and when time was required for the training of workmen. He advocated the continuance of the Optical Munitions and Glassware branch of the Ministry of Munitions after the war, and said that there was evidence that the German glass firms are consolidating under Government control, and we in this country must be prepared to fight them.

Mr. J. Connolly appealed to the whole industry, both masters and men, to pull together. Owing to unfair competition the glass trade in this country in certain branches was less than 50 per cent. of what it was 50 years ago. The industry demanded from the Government a square deal, and then it could defy foreign competition. What we required was a "dump-proof empire," where a fair chance would be given to home production.

Sir Frank Heath, of the Department of Research, urged the absolute necessity to bring science to bear on output, both from the standpoint of quantity and efficiency. The Government fully recognised the importance of industrial research, and was prepared to assist it in a wide sense through trade and industrial organisations. The conditions for grants to industries for research were not likely to be onerous or difficult, and there would be no meticulous or tyrannical interference from headquarters.

Mr. D. Baird briefly outlined what had been done to capture the chemical ware trade from Germany, and spoke of the work still to do. It would be impossible for that branch of the industry to stand on its feet for some time, and the need for "foster parents" was great. Under proper conditions it would be possible to make as cheaply as our enemies and to turn out a better article.

Sir Herbert Jackson, like the President of the Society, was a confirmed optimist as to the future of the industry. At present the war provided the necessary stimulus for pulling together; after the war national prestige must be the stimulus. We must have an honest pride in ourselves and feel it intolerable to take second place. Each section of the industry must help the others, for knowledge gained in one branch is often valuable in another. An enormous amount of knowledge has been accumulated, and the time is very near for representatives of various branches to get together and shape problems of experimental work before the war ends, so that work can then proceed at once. The whole field of research must be viewed and care taken to prevent overlapping. A conference under the auspices of the Society of Glass Technology, in collaboration with a Government Department, would be the surest and best method of tackling the problem. Given Government help and protection it will be the fault of the industry itself if it does not thrive, and the industry can ensure this by organising and by everyone pulling together.

Mr. R. S. Biram, of the Ministry of Munitions (Optical Branch), paid tribute to the great help given by the glass industry in the production of war material under difficult conditions. He predicted more difficult times ahead, as there was bound to be a further call up of labour, together with a shortage of materials and fuel. He advocated more concentration in works, and deplored the lack of enterprise in certain quarters.

Dr. W. Rosenhain stated that much had been done to meet the requirements of war, but asked if the stimulus would last. Unless it did it is doubtful whether any measures will give the desired results. In addition to stimulus and motive power the industry required method. There must be full utilisation of scientific results in the works, and free interchange of knowledge between the scientist and the worker. Petty jealousies must be removed. There must be no extension of concentration to the exclusion of co-operation, because a great deal was to be gained by housing different branches of the industry under one roof. It might be possible to establish an industry by "fostering" it, but the child must grow and learn to be independent.

Mr. S. N. Jenkinson spoke of the great future before the glass industry if only it was allowed to develop. After the war much reconstruction of material and training of labour would be necessary, and the industry would require help, but it must qualify for assistance by becoming efficient.

Many other speakers joined in the discussion, and finally a resolution was drawn up embodying the policy of the Society, which it was decided to circularise among the members for consideration and discussion at the next meeting.

ROYAL SOCIETY OF ARTS.

At the meeting held on May 8, Dr. V. Bretland Farmer, of the Imperial College of Science and Technology, read a paper entitled "Science and the Rubber Industry."

The author dealt mainly with that branch of the industry which is concerned with the production of the raw material, and emphasised the important part which science had played in rendering possible the successful cultivation of rubber in Ceylon, the Malay States, and elsewhere. In enabling the planter to combat parasitic and other diseases, such as *Fomes*, *Phytophthora*, and pink rot, work of the mycologists has been especially valuable.

Proceeding to consider the problems which still await solution or which are likely to arise in the future, Dr. Farmer expressed the opinion that new diseases may conceivably make their appearance, and that such possibilities should be investigated beforehand, so that effective help may be immediately available. In regard to such relatively simple matters as tapping, there is also much to be learnt. The discovery of the existence of wound response and of the spiral arrangement of the laticiferous system of the rubber tree were striking advances, but it is of far greater importance that light should be thrown on the chemical antecedents of rubber and on the physiological significance of its production. Research on these points should be subsidised, not with a view to any immediate effect on dividends, but with the idea of establishing the plantation industry on such a sound and scientific basis that the possibility of the production of synthetic rubber in the future may be contemplated without serious concern. Breeding and kindred problems also require patient and systematic study in order that yields may be improved and a stock raised which shall be better able to resist the attacks of the various pests. Finally, there are soil problems which are bound to call for a far greater share of attention than they have hitherto received. In this, as in several of the other matters referred to, the Americans appear to be outdistancing us.

The author suggested that the investigations should be taken in hand by the Governments concerned, assisted by an administrative body, on which the planting industry and the different branches of science involved should be properly represented. Such co-operation would make for real efficiency, but it would be essential that the enterprise should be definitely freed from the start from all demands for immediate or even early practical results. The expense would be small compared with the magnitude of the interests at stake. At the present time, in the Middle East, the total proportion of revenue from the Government and from the planting sources which can fairly be charged to expenditure on science in rubber production amounts to a few thousands per annum—say, 12,000*l*. The estimated value of last year's crop is about 50,000,000*l*. In round numbers, this means

less than sixpence per 100*l*., and even of this only a small fraction is spent on research and investigation. As Dr. Farmer said, "This can hardly be regarded as an adequate proportion to spend by way of insurance on the only effective means of combating disease and of forestalling chemical synthesis."

The paper by Dr. M. O. Forster on "Organic Chemistry in Relation to Industry," read on May 23, embodied a powerful plea for the better recognition of organic chemistry as a vital factor in British industry.

After demonstrating the "key" or pivotal character of the dye industry, the author enumerated a number of other industries which were either based upon, or intimately connected with, organic chemistry. The general public, he said, far from realised the existence of this interdependence, and its ignorance is assignable to the tardiness with which even the highest educational authorities have recognised organic chemistry as a science *per se*. Several British universities have only established chairs of organic chemistry in comparatively recent years, and ten of them still possess but one professor of chemistry apiece, and he may, or may not, be an organic chemist. The comparison between Britain and Germany in this respect is very unfavourable to us, and the result is that the annual output of chemical talent in Germany is between four and five times greater than it is in this country; this inequality has been operative for many years past.

Dr. Forster then proceeded to elaborate the thesis that organic chemistry offers one of the most attractive means of cultivating the human intelligence. Its history is full of romance, its systematisation is the "crystallisation of orderliness," it appeals to the creative instinct and to the imagination, in common with other branches of chemistry it develops manipulative skill or craftsmanship and offers many attractions to the mathematical mind. Not least among the virtues of chemistry is its influence upon character, for it inculcates veracity, perseverance, attention to detail, observation, judgment, and patience.

Reverting to the more utilitarian applications of the science, the author referred briefly to synthetic dyes, bio-chemistry, therapeutics, agriculture, toxicology, spices and perfumes, and then proceeded to stigmatise the national defect of neglecting the study of the inner qualities of things, as, for example, the chemical and physical properties of the materials of industry. This and other blemishes are traceable to a want of understanding between the practical man and the college graduate, which can only be remedied by a radical change in our educational system. Boys and girls must be given the opportunity to develop along the lines of their natural gifts, and the huge mass of moderate capability must no longer remain comparatively neglected for the sake of the few who have genius. A significant, if depressing, example of ignorance was the publication of the story of the capture of German dye secrets (this J., 1918, 27R), an incident which suggested the revival of the "poisonous heresy" that Germany had stolen the dye industry from this country, and that therefore we should steal it back. Germany earned that industry and won it from Nature by hard work, indomitable patience, far-sighted employment of profits in fresh experiments, skilful organisation of resources, careful attention to the requirements of customers, scientific control of manufacturing operations, ever-widening enlistment and encouragement of chemists, utilisation of by-products, ingenious application of engineering principles, and by the acquisition of cheap raw materials.

One of the principal obstacles which prevents the public recognising its indebtedness to organic chemistry is the extreme difficulty of popularising it, and this circumstance is also responsible for the tardy development of the dye industry in this country. The value of the organic compounds known as "intermediates" is not sufficiently appreciated, nor is the fact that so long as we purchase these materials from other countries we can never establish a successful independent British industry. The recent rapid progress in the United States is largely due to the great scale on which essential intermediate products have been manufactured, and to the moral support given by a tariff; for the promised defence against "dumping" has proved adequate to inspire the confidence of private capital. The recent promise of support by the British Government (this J., 1918, 294R) was cordially appreciated by the lecturer, but, as he pointed out, money and State acknowledgment alone will not suffice; there must also be some readjustment in the allocation of profits; an adequate proportion of them must be reinvested in the industry.

THE PROFESSION OF CHEMISTRY.

BRITISH ASSOCIATION OF CHEMISTS.

Birmingham.

This section of the Association held its meeting at the University on May 23, Mr. E. W. Smith presiding.

In addition to the two resolutions submitted by the Executive (this J., 1918, 199R), there was a third (unofficial) resolution, moved by Dr. Parker, as follows:—

"That the provisional Society of the British Association of Chemists shall continue in being until:

(1) Local sections of the Institute have been formed.

(2) New regulations for admission to the Institute have been put in force.

(3) The new regulations for nomination and election to the Council of the Institute have been formulated and adopted by the Institute.

In the meantime all chemists who support the proposals as indicated in the Third Report of the B.A.C. shall be considered as eligible for membership of the provisional society of the B.A.C., it being understood that such membership carries with it no obligation on the part of the B.A.C. or the Institute."

In the course of his remarks the Chairman said that there were many objections to the introduction of trades union principles; his view was that the financial position of qualified chemists and of juniors who wished to become such could be much improved if qualified men in charge of chemists' would band together and make it their business to see that only qualified juniors were engaged, that their education was properly supervised, and that adequate facilities were given by which they could obtain a sound and satisfactory training. The salary level would be much improved if determination were shown by chemists in responsible administrative positions; they must use their influence with the firms. There was a moderately large body of opinion in favour of the continuance of the B.A.C. as a political organisation, having no connexion with registration, but the answer to that was that the local sections of the Institute would give the necessary impetus to the Institute Council.

The first resolution—that the demands of the Association had been reasonably met by the Institute of Chemistry—was carried by 97 votes to 5. The second resolution—that the Association should cease to exist after the local section of the Institute had been established—was negatived by 70 votes to 27; and the third resolution (*v.s.*) was carried by 41 votes to 1.

A meeting to elect the Local Council will be held shortly in Birmingham.

Leeds and Bradford.

The proposals of the Institute of Chemistry came before a meeting of chemists of the Leeds and Bradford district at Leeds on May 24, under the presidency of Mr. W. Harrison, local chairman of the provisional Association. It had been intended to take a ballot at the meeting, but it was decided, for various reasons, to substitute a postal ballot. There was a very good attendance, and a feature of especial interest was an address by Prof. J. W. Hinchley (chairman of the London Section), which manifestly influenced the feeling of the meeting.

The Chairman, in his opening speech, said that the local Committee had not been able to decide upon a recommendation in regard to the future existence of the B.A.C., and consequently Prof. Hinchley had been invited to address the meeting.

Mr. A. E. Jordan asked what would be the position, in the event of the B.A.C. being absorbed by the Institute, of older practising chemists who had no degree, and perhaps nothing more than certificates of College examinations, but who nevertheless held important positions.

The Chairman replied that he could only refer the inquirer to proposal (2) of the Institute. If the provisional British Association went forward this proposal would be absolutely adhered to, but no definite statement could be made as to the result of any case under the Institute's regulation.

Dr. Lloyd thought that probably not more than one-third of those who had joined the Association would satisfy the requirements of the Institute, but the other two-thirds formed the class of men they should work for most of all.

Mr. Hickson said the Committee wanted to know what the chemists of this district desired the B.A.C. to do in order that it might go before the Executive with a strong policy.

Mr. J. C. Smith said the general feeling was that while the proposals of the Institute were excellent in many ways, they were in some respects very indefinite, particularly as applied to older men of a certain class, and until the position of these men had been satisfactorily dealt with by the Institute the B.A.C. should certainly carry on.

Prof. Hinchley said the proposals of the Institute covered all they could expect, but there were certain things that the Institute could not do, and which the educational societies were not out to do, and he would be glad to support the B.A.C. in seeking to do these things, some of which at any rate were urgently needed in view of the reconstruction that must follow the war. Under the conditions that were coming he was convinced that chemists could only "do their bit" towards reconstruction if they were organised locally; and if they believed that the B.A.C. should continue, with local sections that would handle local industrial problems, then he was entirely with them. While it was good that chemists should pay attention to matters concerning professional qualifications and to the hall-marking of qualified men, it was also important that every man should belong to a society or organisation that would look after his personal interests and the interests of the chemists of the locality as a body. The old theory that it was only possible to make a living at the expense of somebody else, which had been at the basis of the attitude of both many employers and of modern trade unionism, was now exploded, and it was for chemists amongst others to make it clear that if the industries of the country were carried on by intelligence and reason a comfortable existence was possible for all. In relation to the Whitley Report too—to the principles of which the Government was pledged—he would remind them that the basis of the whole scheme of industrial councils was organisation on industrial lines. He was convinced that the British Association of Chemists should go on, and all the more so for the very reason that it was not a chartered body, and that it could therefore adapt its constitution to meet new conditions.

The results of the postal ballot were as follows: Resolution (1), for 48, against 35; resolution (2), for 5, against 89. An additional resolution proposing that the B.A.C. should enlarge its scope in accordance with the desires of the chemists of the country as expressed at local meetings or elsewhere was carried by 83 votes to 4.

Liverpool.

A meeting of the Liverpool Section was held at Liverpool University on May 24, Mr. W. H. Roberts presiding over a gathering of 80 chemists from the district.

The resolution having for its object the amalgamation of the Association and the Institute was proposed by Dr. Tate, who stated, *inter alia*, that he had for long held the opinion that membership of the Institute should be open to what were termed technically trained chemists, and that academical, *i.e.*, university training, should not be a *sine quâ non* of membership. Mr. Taylor briefly seconded the resolution, which, on being put to the meeting, was carried with only two dissentients. The result of the postal vote was 163 for and 21 against.

The second resolution evoked a prolonged discussion.

Dr. Kay read a letter from Dr. E. F. Armstrong, who held that the policy of the Association should be shaped by the younger men, and whilst a multiplicity of associations was to be deprecated, yet, in view of the fact that the Association had done so much to arouse interest, it should not cease to exist.

Dr. Kay, referring to a communication from the London Section of the Association, said that that section with others did not consider that the arrangements come to with the Institute met all cases, as many chemists could not become members of it. Moreover, the Institute as a hall-marking body could not appropriately look after their more immediate welfare. Chemists should organise on the lines of the medical profession, *i.e.*, there should be two controlling bodies, corresponding to the General Medical Council and the British Medical Association, one to register qualified men, and the other to watch over their economic and more personal interests.

The Chairman considered that all the chemists in the country should first be registered, and when that had been effected the Association should be formed for none but registered chemists.

Mr. Gabriel Jones suggested that the Association should continue as a defence organisation and that membership should be confined to those properly registered He agreed with the London view that the Institute, bound by its Charter, could not act as a trades union, whereas something of that nature was required, therefore he moved that "This meeting of Liverpool chemists is of the opinion that the British Association of Chemists shall continue to exist as a defence association, and shall be com-

posed of chemists registered by a central registration authority."

The proposal was put to the meeting in a slightly modified form and carried by a substantial majority.

Newcastle.

The local mass meeting of chemists called by this section was held in the Mining Institute, Newcastle, on May 25, Dr. J. T. Dunn being in the chair. There was an attendance of forty members. Considerable discussion took place over the two resolutions before the meeting, there being a general feeling that the new Society had a great deal yet to do.

There were 37 votes for and 15 against resolution (1), and resolution (2) was rejected by 17 votes to 2.

The following resolution proposed by Mr. Dunford Smith was carried almost unanimously :—

"This meeting of northern chemists considers that the B.A.C. ought not to be allowed to become defunct until such time as either the Executive Committee of the B.A.C. or the B.A.C. itself considers that practically all chemists of at least seven years' practical experience have been included in some kind of professional union or guild."

South Wales.

The members of this section held a meeting at Llanelly on May 25, to which all chemists resident in South Wales were invited. Dr. J. W. McDavid was in the chair, and there was an excellent attendance.

Dr. E. Vanstone, in moving the resolutions, recapitulated the aims of the first B.A.C. Manchester meeting, and reminded members that from the outset it was felt that those objects could best be obtained by the Institute of Chemistry broadening its membership and scope. The result of the negotiations was that men with an honours or pass degree were now directly admitted to the Associateship without examination, and even men without degrees were in certain cases accepted. The Associateship was unquestionably the best standard to adopt. The only thing that remained now was to form local branches and place the election of the Council of the Institute on a more democratic basis. When these objects, which are now promised, are achieved the work of the B.A.C. will be finished, for there is surely no room for two such bodies, and men would not subscribe to both.

Mr. H. Mansfield was asked to state the other side of the question. He agreed with Dr. Vanstone that the Institute was unquestionably the best qualifying body, both on account of the position it had reached and in view of the membership it already possessed; at the same time he pointed out that the Manchester meeting of last November decided (and wisely he thought) that the qualification for membership under heading B should be "a sufficient general education" together with seven years' chemical experience, whereas the latest Institute regulations insist on a three or four years' academic training. Are the men whose training has not been "academic," but whose knowledge and experience are beyond question, and who certainly deserve to be called "chemists," to be excluded from our fellowship?

According to its charter, the Institute was not "established for purposes of gain," and he wished to submit that the profession could not be effectively raised unless the financial standing of its members were looked after. The class of men who are suited to examine and give qualifications are, broadly speaking, not the men to further the finances of the younger men. Moreover he was of opinion that the Privy Council would have to be invoked before the election of the Council could be put on a democratic basis. The whole matter was in a nebulous condition, and, in view of the time and money which had been spent on building up the B.A.C., it seemed a pity to disband while its work was only half done.

The discussion then became general, and finally the ballot resulted in 29 votes being given for and 10 against resolution (1); for resolution (2) 15, against 22.

After the ballot Mr. P. White proposed the following recommendation to the Executive of the B.A.C. :—

"That the members of the B.A.C. be requested to discuss and formulate their views regarding the economic side of the question, and consider the construction of machinery to carry out their findings."

The motion was seconded and carried.

Hull.

On May 25 a meeting of 29 chemists was held in Hull to discuss and ballot on the proposals of the Institute of Chemistry. Mr. H. Thompson was in the chair.

Mr. A. R. Tankard spoke of the fairness and suitability of the proposals of the Institute of Chemistry, and suggested that those chemists who possessed somewhat different qualifications from those required by the Institute should submit them to the Council for consideration. He expressed the opinion that the B.A.C. qualification for membership did not differ materially from the one the Institute suggested.

Mr. J. Kelly (Bridlington) was astonished that no provision had been made for the chemist, particularly the older man, whose experience and position were beyond question, but who might not be able to satisfy the academical portions of the Institute's proposals. Such chemists ought to be excused a rigid compliance during the transition period. As it stood, regulation (2) of the Institute was quite impossible (this J., 1918, 175 R).

Mr. H. G Bennett (Beverley) criticised the two regulations, and contended that the first was ambiguous, and the second was too stringent in character and might easily prevent desirable chemists from being recognised as qualified. He thought, however, that the Institute's proposals should be accepted as a provisional solution.

Mr. T. Dodds expressed regret that there was a probability of the B.A.C. ceasing to exist as a separate organisation if the Institute's terms were accepted. The keen interest manifested by the profession throughout the country, especially amongst technical chemists, was evidence of the need for such an association. The acceptance of the Institute's conditions might lead to the "deprofessionalising" of a great number of the older men, who occupied positions of responsibility involving wide knowledge and lengthy experience. He held no brief for the younger men: they might be asked, reasonably, to comply with the recommendations.

Mr. Dodds spoke appreciatively of the Institute's endeavour to meet the B.A.C., but if it was intended that the Institute should be regarded ultimately as the sole "registration authority," then it seemed to him that there was a clear case for "a clean cut" in the case of men over a certain age. If the Institute's charter did not admit of a register of non-diplômés, then it should be modified so that the men referred to could be registered without the necessity of conferring the diplomas, the register to close after a fixed date.

The ballot was then taken with the following result: Resolution (1), for 2, against 37; resolution (2), for 1, against 38.

Mr. Dodds proposed, and Mr. Smith seconded :—

"That the present policy of the Institute of Chemistry as outlined at their Extraordinary General Meeting does not adequately meet the need for the better organisation of the chemical profession, and, therefore, the B.A.C. shall continue its existence to safeguard the carrying out of the B.A.C. original programme."

Mr. H. Waites proposed, and Mr. H. S. Stead seconded :—

"That this meeting appreciates the efforts the Institute have made in their proposals of April 27, 1918, but deplores the absence of any provision for chemists who may fall short of the academical requirements in Clause 2, but whose experience and position are beyond question."

Both these resolutions were carried.

Edinburgh and East of Scotland.

A general meeting of chemists was held in the University on May 28, with Prof. James Walker in the chair.

Resolution (1) was moved by Dr. A. Lauder, who claimed that the proposals of the Institute marked a very real and important advance in its policy. Further changes were by no means excluded if experience showed them to be desirable. Dr. T. W. Drinkwater seconded.

In moving the second resolution, Mr. B. D. Porritt, chairman of the local committee, discouraged the continuance of the B.A.C. after local sections of the Institute had been established; multiplication of societies was a source of weakness. Mr. J. B. Robertson seconded the resolution. A discussion ensued, in which the following took part: Drs. Cumming, Dobbin, and Ranken, and Messrs. Martin, Annan, Grant, and Kirkcaldie.

The result of the ballot was as follows: Resolution (1), for 70, against 5; resolution (2), for 12, against 53.

Nottingham and Derby.

The meeting of the Nottingham and Derby section was held at University College, Nottingham, on May 29.

Prof. F. S. Kipping presided, and drew attention to the important concessions which had been granted by the Institute of Chemistry, and particularly to that whereby chemists could obtain the A.I.C. without examination. All the proposals of the B.A.C. had been reasonably met, the Institute having done all that was possible within the limits of its charter, and therefore it appeared that resolution (2) was superfluous, especially if the Institute became the registration authority for chemists.

Dr. Hedley also emphasised the value of the concessions granted. The Institute was prepared to do all that was possible for chemists short of adopting trade union methods, and therefore the B.A.C. would have finished its work after the formation of the local sections. To vote for the continuance of the B.A.C. would be discourteous to the Institute, which was now prepared to do for industrial chemists what it had long done for analysts.

Some difference of opinion was shown by subsequent speakers as to the desirability of continuing the B.A.C. It was felt by several that there were some men who were experienced and competent chemists who could not produce evidence of academic training or the passing of examinations, and who would therefore be excluded from the Institute and perhaps robbed of a livelihood. For such men the B.A.C. might still be of service.

In reply to this objection, Prof. Kipping, and also Mr. F. H. Carr, said that in their experience they had found the Institute very willing to consider exceptional cases, so that the hardships which were anticipated were unlikely to arise.

Mr. J. T. Wood asked what test the B.A.C. could substitute for that of the Institute, and Dr. Hedley replied that no substitute was proposed. The B.A.C. has desired to raise the status of the chemist, and the Institute has had an identical aim. That is why they are agreed. There are men, however, who practise chemistry but are not chemists, and these would not secure the Institute qualification.

Mr. Droop Richmond deprecated a narrow or selfish point of view in considering this matter. In the coming struggle chemical industry must not be handicapped by the conferring of the hall-mark of the Institute on people without the necessary education. If the B.A.C. were continued separately from the Institute the qualification it would confer would be valueless.

The voting on the two resolutions was as follows: Resolution (1), for 31, against 4; resolution (2), for 13, against 22.

Mr. Droop Richmond raised the question of the formation of a local section of the Institute, but no steps were taken.

Glasgow and West of Scotland.

Mr. J. Macleod presided over the gathering of chemists held in the Royal Technical College, Glasgow, on May 30. The meeting was addressed by the chairman, by Prof. G. G. Henderson, and by Mr. B. D. Porritt, of Edinburgh. The questions at issue were debated at length, and at the close the results of the ballot were announced to be: Resolution (1), for 72, against 7; resolution (2), for 50, against 34.

Manchester.

The local meeting was held in the College of Technology on May 31, the Principal of the College, Mr. J. C. Maxwell Garnett, presiding.

Dr. R. B. Forster moved the two resolutions, and the prolonged discussion which followed showed that the value of the services of the Institute of Chemistry was fully recognised, but that the proposals set out in the Third Report of the B.A.C. Executive did not meet the needs of the large number of works chemists who would be left out of the intended organisation.

During the counting of the votes on resolutions (1) and (2) Dr. Forster proposed further resolutions as follows :—

(*a*) If resolution (2) be carried by a cumulative vote, the B.A.C. should keep a continuous and critical survey of the movement till the organisation was on a satisfactory basis.

(*b*) If resolution (1) be carried on a cumulative vote, the B.A.C. is to put forward applications by members of the B.A.C. for admission to the Institute of Chemistry after scrutiny by the B.A.C. Executive, who should call in the aid of other technical committees.

Principal Garnett decided that a separate vote should be taken on each.

All the resolutions were carried, (1) by 121 votes to 120, after a recount had been made, (2) by 197 to 44, (*a*) unanimously, and (*b*) by a large majority.

Sheffield Association of Metallurgists and Metallurgical Chemists.

As this Association is acting locally for the British Association of Chemists, a meeting was convened to discuss the latter's proposals, at which it was decided to leave the whole matter in the hands of the Council of the Sheffield Association. Since this meeting ballot cards have been circulated, and the Council, after careful consideration, has recommended that when the Institute of Chemistry shall have carried out the recent proposals, the B.A.C. will have accomplished the work it set out to do, but that the B.A.C. should carry on until such time as the Institute's proposals are in operation.

NEWS AND NOTES.

AUSTRALIA.

STEEL MANUFACTURE.—The Broken Hill Proprietary Company intends to raise fresh capital amounting to £637,988, to provide for the expansion of the Newcastle Steel Works.

PLATINUM IN NEW SOUTH WALES.—The recent discovery of platinum near Fifield has been officially investigated. The metal occurs as alluvial in a lead or placer deposit, which extends for about half a mile from the prospectors' claim, the depth to the wash varies from a few feet up to almost 80 ft., and the average thickness of pay dirt is 2 ft. 6 in. to 3 ft. Over 400 loads from 10 claims have given an average yield of 4 dwt. platinum and ¼ dwt. gold to the load. The discovery is regarded as the most important made in this State for some years past, and will probably direct attention to the large known area of surface soil containing platinum in the vicinity.—(*Austral. Ind. and Min. Stand., Mar.* 7, 1918.)

GYPSUM IN SOUTH AUSTRALIA.—The Department of Chemistry has issued a report on the occurrence of gypsum in South Australia, and on the methods of manufacture of commercial products (notably plaster of Paris) obtainable therefrom. South Australian gypsum has now taken the place of the mineral formerly imported from Germany and the U.S.A., and it has also been exported to the other States and to New Zealand for use in cement manufacture and as a fertiliser. The proposed use of gypsum as a source of industrial sulphur is engaging serious attention.—(*Bd. of Trade J., May* 2, 1918.)

METHODS OF STORING GRAIN.—The Advisory Council of Science and Industry has issued a report dealing with the problem of grain pests, in which the method of treatment of wheat by lime and storage in large basin silos is recommended for trial. It is very important that the lime used shall be freshly ignited and hot, and not partially slaked.

It has also been discovered that an effective indication of the contamination or deterioration of wheat is afforded by the ammonium content of the extract obtained by soaking the wheat in water. Thus the damaged samples examined were found to yield from 8 to 15 times as much ammonia as the clean wheats.

Various methods for destroying pests by poisonous gases are set out in the report, but experiments on a large scale are said not to be applicable to bagged grain, save at a prohibitive cost. The most effective gas was found to be carbon dioxide. One ton of grain can be submerged by 14·35 cubic ft. of gas. This is forced in at the bottom of the wheat or airtight silo. The total cost works out at 4¾d. per ton.—(*Bd. of Trade J., May* 16, 1918.)

CANADA.

CANADIAN IRON AND STEEL INDUSTRY.—Efforts are being made at Vancouver and Victoria to secure the establishment of an iron and steel industry, and the Dominion, Provincial and Municipal Governments will be urged to finance the industry by bonus or guarantee. The iron ores of the province are mainly magnetites, of which some carry too much sulphur. The amount of ore available is placed at 15,000,000 to 20,000,000 tons. A few small deposits of limonite are available to mix with the magnetite, but no deposits of haematite of economic value have as yet been proved on the coast.—(*Iron and Coal Tr. Rev., April* 26, 1918.)

MINERAL PRODUCTION IN ONTARIO, 1917.—The mineral production in Ontario during 1917, according to returns of the provincial Bureau of Mines, was valued at $71,060,942, as compared with $65,303,822 in the previous year. The largest contributions to this total were: Gold, $8,698,000; silver, $16,193,000; copper in matte, $7,842,000; and nickel in matte, $20.943,000.

The refinery of the International Nickel Company of Canada, which is being built at Port Colborne, Ontario, is nearing completion; it will have a capacity of about 10,000 tons of nickel per annum. The Canadian Copper Company, the operating subsidiary of the International Nickel Company in Ontario, has been mining about 1,000,000 tons of ore per annum to supply the Perth Amboy refinery in New Jersey with raw material. To maintain this plant in full running order it will be necessary to increase mining activities.—(*Bd. of Trade J., May* 2, 1918.)

MINERAL PRODUCTION IN CANADA, 1917.—According to a preliminary report issued by the Department of Mines, the value of the mineral output for 1917 was $192,982,837, an increase of 8·9 per cent. over that in 1916. Although the value figures show an increase in most cases, the quantities in many instances show a decline. Thus coal, at about 14,000,000 tons, decreased by 3·2 per cent., copper by 7 per cent., lead 22·7 per cent., silver 13 per cent., and gold 19·7 per cent. There were important increases—in the case of zinc 33·5 per cent., and of cobalt 29·6 per cent.; smaller gains were registered for nickel and molybdenite. The amount of pig iron produced from Canadian ores showed a big decline, although the total output was somewhat greater, as more imported ore was smelted. The value of the non-metallic mineral production was $86,352,085, an increase of nearly 22 per cent. over 1916, but the quantities of coal, graphite, gypsum, and cement were actually less, despite the increased values.

NICKEL AND COPPER REFINING IN QUEBEC.—A contract for the construction of nickel and copper refining plant at Deschênes, Quebec, for the British-American Nickel Corporation, stipulates for completion by the end of the year. The building will cost over £200,000, and a huge army of workmen will be employed. British and Norwegian interests are behind the enterprise.—(*Times, May* 18, 1918.)

SOUTH AFRICA.

THE OIL-SEED INDUSTRY OF RHODESIA.—In view of the fact that even before the war it was becoming difficult to cope with the world's demand for oils and fats for the manufacture of margarine, and that this difficulty has been increased during the war, it is interesting to note that the cultivation of oil-seeds promises to become an important industry in Rhodesia. At present ground nuts and sunflower seed are the only oil-seeds produced commercially, but experiments conducted at the Agricultural Experiment Stations indicate that other oil-seeds may be grown successfully. Castor seed, sunflower seed, sesame seed, and linseed grown at the Government Experimental Gardens in Northern Rhodesia have recently been received at the Imperial Institute, and the results of the examination were entirely satisfactory.

Before the war sesame seed was chiefly crushed on the Continent, owing to the fact that in several Continental countries the inclusion of a certain quantity of sesame oil in margarine was compulsory, in order to facilitate detection of the margarine when used to adulterate butter. Sesame seed is, however, now being crushed in the United Kingdom—to which the Rhodesian seed will no doubt come after the war.—(*Bd. of Trade J., May* 9, 23, 1918.)

MANUFACTURE OF ELECTROLYSERS.—The Department of Industries has been advised that a company is now being formed to undertake the manufacture

of electrolysers for use in the preparation of hypochlorite of sodium.

Industrial Alcohol.—According to the Minister of Mines and Industries the production of industrial alcohol in the Union has reached 10,000 gallons, and there are 30,000 gallons of spirit on hand which had not been denatured owing to supplies of denaturants being exhausted. The industrial alcohol produced has been sold at 2s. 6d. and 3s. per gallon.—(*Board of Trade J., May* 9, 1918.)

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Sodium Arsenite.—The scarcity of this compound is causing much inconvenience, as the dipping of cattle with arsenical dips is compulsory by law. The pre-war price was 26s. per cwt.; it is now 125—150s. The Department of Industries is endeavouring to induce local manufacturers to make it, as the necessary materials are produced in the Union. Up to the end of January last the Stavoren Tin Mining Company produced approximately 10,000 lb. of arsenious oxide containing 97·5—98·9 per cent. As_2O_3, and the Consort Mine, which could turn out 5—6 tons per month, is understood to have on hand about 10 tons of fume containing 77·13 per cent. of the oxide.

Liquid Ostrich Eggs.—The report of the Imperial Institute on a consignment of ostrich eggs in liquid form gives the following analytical data: Water, 75·1 per cent.; protein, 10·7 per cent.; fat, 11·4 per cent.; and ash, 1·4 per cent. Chinese liquid eggs contain: Water, 70·7 per cent.; protein, 12·7 per cent.; fat, 12·7 per cent.; and ash, 1·7 per cent. If the above figures are calculated on a uniform basis of 75 per cent. of water, the composition works out the same in the two cases; and it is also seen that liquid ostrich eggs contain less protein and more fat than average hens' eggs, though rather less of these ingredients than ducks' eggs. The report adds that the strong odour of liquid ostrich eggs may prevent their use for edible purposes, but that they might be useful for technical purposes in the forms of egg albumen and of preserved egg-yolk in the leather industry.—(*S. Afr. J. Ind., March* 1918.)

South African Mineral Output, 1917.—The Government Mining Engineer has compiled the following preliminary statement:—

Metals, Minerals, or Precious Stones.		Twelve months ended December 1917.	
		Quantity.	Value.
			£
Gold	(fine oz.)	9,018,389	38,307,675
Silver	,,	938,146	122,951
Diamonds	(carats)	2,902,417	7,736,371
Coal	(tons)	10,382,623	3,255 659
*Copper	,,	20,174	1,106,085
*Tin	,,	2,688	375,615
*Antimony	,,	617	12,428
Asbestos	,,	6,220	87,364
Corundum	,,	2,629	13,038
Graphite	,,	8[illegible]	2,590
Iron oxide	,,	121	305
Iron pyrites...	,,	2,856	4,463
Kaolin	,,	28	19
Lead	,,	270	3,761
Magnesite	,,	781	2,050
Manganese	,,	124	641
Mica...	,,	4	877
*Nickel	,,	—	—
Tungsten	,,	9	1,551
Soda	,,	5,716	29,377
Talc	,,	785	1,962
*Zinc	,,	—	—
Lime	,,	89,057	131,373
Flint	,,	180	1,120
Gypsum	,,	2,082	5,092
Totals	,,	—	51,202,367

* The valne given is calculated on the percentage of pure metal content at London quotations.

GENERAL.

British Scientific Products Exhibition.—H.M. the King has graciously consented to become Patron of the Exhibition. The Marquess of Crewe is President, and among the Vice-Presidents are the Prime Minister; Mr. Winston Churchill, Minister of Munitions; Sir Albert Stanley, President of the Board of Trade; Mr. H. A. L. Fisher, President of the Board of Education; Dr. Addison, Minister of Reconstruction; Lord Moulton; Lord Sydenham; Sir J. J. Thomson, President of the Royal Society; and other distinguished public men.—(*See this J.*, 1918, 177R.)

Proposed Engineers' Club for the Midlands.—A meeting was recently held in Birmingham to consider the proposal of forming a club for engineers on similar lines to the Engineers' Club of Manchester. The latter has intimated its readiness to render all the assistance possible, the idea has been enthusiastically taken up, and a provisional committee appointed to work out ways and means. Membership of the Club will not be restricted to engineers, and all technologists will be eligible. There are two well-known chemists on the Committee, of which Dr. C. C. Garrard is provisional chairman, and Mr. J. Fearn, of the Birmingham Small Arms Company, provisional Hon. Secretary.

Fuel Oil Supply.—The question of increasing home supplies of fuel oil has been receiving serious attention for some time by the Munitions Mineral Oil Production Department. As no mineral oil deposits have yet been proved in this country, the only method of increasing the supply is by distillation of such minerals as oil shales, coal, cannels, &c. After due consideration the idea of working Norfolk and Dorset oil shales was abandoned, owing to the difficulties on the one hand of initiating a new industry in rather remote districts, or alternatively of transporting large bulks of material over long distances to existing shale plants. The low temperature distillation of cannel coal was suggested, and experimental work has been commenced. In the meanwhile a solution was sought in the utilisation of existing vertical gas retorts. It has been found that cannel coal gives good results when submitted to a combination of high and low temperature carbonisation. The temperature at the top of the retort is kept at about 800—900° C., increasing to 1300—1400° C. at the bottom, a certain regulated amount of dry or slightly superheated steam being also admitted. In this way oil vapours produced from the non-caking cannel at the top of the retort are swept away by the gas generated in the lower and hotter zone, without undergoing serious cracking. A good yield of oil is obtained without materially affecting the quality or quantity of gas formed. In an experiment a rather poor bastard cannel testing 30 per cent. volatile matter and 9½ per cent. ash yielded 20 gallons of crude oil, 11,200 cubic ft. of gas of calorific value 540 B.Th.U., and 40 lb. of sulphate of ammonia per ton of coal carbonised. The crude oil, after a simple mechanical treatment, yields a good fuel oil, in the above instance, to the extent of 17 gallons per ton of coal. Richer cannels will be used in practice, and higher yields are anticipated. Very little additional plant is required at the gas works (a small steam plant and a tar dehydrator), and it is hoped that within a few weeks there will be sufficient installations available for the treatment of the whole cannel production of the country.—(*Times Eng. Suppl., May* 1918.)

Italian Beet Sugar Industry.—Prior to 1899 all the sugar used in Italy was imported. In that year the cultivation of the sugar beet was inaugurated and the sugar industry made rapid strides. The production in the first season was 5,900 tons;

this rose to 23,100 tons in 1899—1900, and to 305,500 tons in 1913—1914. As the normal domestic consumption is 175,000 tons, there was a surplus for export, and arrangements were made in 1915 to export 65,000 tons to France and Great Britain. Subsequent poor crops have, however, caused a shortage, necessitating much economy in distribution and consumption. The season 1915—1916 yielded only 140,000 tons, and special efforts were made to increase the production for 1917. Owing to the exigencies of the military situation, the supply of labour proved insufficient, and the sugar production in 1917 was only 100,000 tons.—(*U.S. Com. Rep., Mar.* 27, 1918.)

POSSIBILITIES OF SUGAR-BEET CULTIVATION IN INDIA.—For the last six years sugar-beet has been grown at the Peshawar Agricultural Station on areas of not less than one acre, with yields averaging from 16 to 17 tons of roots per acre, and having over 15 per cent. of sucrose content. If largely taken up in the North-West Frontier Province, says the Report for 1916-17 on the Progress of Agriculture in India, the value of this crop cannot be overestimated; for beet ripens in six months, while cane requires nine months, and 15 tons of beet yield as much white sugar as 20 tons of cane; while the number of irrigations for sugar-beet is only one-fifth of that given in the case of sugar-cane. Moreover, beet can be sown after the cane is taken off the field, and can be raised without much or any direct manuring.—(*Bd. of Trade J., May* 16, 1918.)

USE OF LIGNITE IN FRANCE.—*La Chambre syndicale de la Tourbe et du Lignite* has published a report on the use of lignite in France.

The operation of lignite mines has been greatly hampered by lack of labour and transport. There are about 30 deposits of lignite in France, in which the material is found in different forms. In the Rhone it is compact and bituminous, in the Garonne it is black and friable, and in the Yonne it is ligneous. The material is best used in the form of briquettes; it is difficult to agglomerate, and, if binding material is not available, it must be washed and then submitted to high pressure. Earthy and ligneous lignite containing up to 45 per cent. of water must be dried by steam or gas heating to reduce the humidity from 8 to 10 per cent. for making briquettes. Dry lignite can be made into briquettes without binding material if pressures between 800 and 1,200 kg./sq. cm. are employed, as is done in Germany and Italy. In America it is preferred to partly distil the lignite, and the residue is easily made into egg-shaped balls. Lignite mixed with carbon can be burned in the grates of ordinary boilers, a good mixture being 60 per cent. of coal and 40 per cent. of lignite. The distillation of 100 kg. of lignite produces about 40 kg. of coke and 12 kg. of tar. It is recommended that the Government should assist the production of lignite by removing certain taxes, offering facilities of labour and for obtaining materials necessary for the operation of the mines. The German Government has succeeded in increasing the use of lignite by special measures adopted with this end in view.—(*Rev. Gén. de l'Electricité, Feb.* 2, 1918.)

WOOD PULP AND WOOD CHARCOAL IN SWEDEN.—The wood-pulp industry takes the second place in value among Swedish industries, the total value of wood and wood pulp exported in 1913 amounting to £17,352,184, or about two-thirds of the total exports. The ratio of pine to spruce was about 3 : 2. In that year there were 167 pulp factories, 83 being mechanical pulp mills. The production of air-dry pulp is estimated at 326,098 tons of mechanical, 705,099 of sulphite, and 155,430 of sulphate pulp; total 1,186,577 metric tons, of which 847,137 tons were exported. Another forest industry in Sweden is the manufacture of charcoal, which is used in the iron-smelting industry near the place of production. About 75,502,000 bushels are produced by the old method of charring in piles in the forests and 29,166,000 bushels from saw-mill waste by the same method. Latterly, by-product ovens have come into use; the quantity of charcoal thus produced is given as 8,063,000 bushels from forest wood and 1,323,000 bushels from saw-mill waste for the year 1913. Formerly the preparation of wood tar was an important export industry, but at the present day the manufacture is confined to the most northern provinces; for 1913 the export of tar was 7,996 tons, value £52,841. Some of the saw-mills have tar ovens in which other volatile by-products are recovered.—(*Bull. Agric. Intell.*, 1918, **9**, 1-8.)

SUBSTITUTES FOR DEFICIENT METALS IN GERMANY.—More than a quarter of the world's supply of zinc is produced by Germany. According to Schulz (this J., 1915, 1147) commercial refined zinc contains 98 per cent. or more of zinc, about 1·3 per cent. of lead, and about 0·2 per cent. of iron, with some cadmium. It is crystalline in structure and lacks tenacity. Its hardness and strength can be improved by the addition of aluminium or copper, but iron and tin are unsuitable for the purpose. In any case the alloy must contain about 90 per cent. of zinc, and not more than 3 per cent. of aluminium can be added without the risk of the formation of cavities. A zinc alloy containing about 6 per cent. of copper and 3 per cent. of aluminium is a suitable material for casting for many purposes, though not for constructional work. For galvanising with zinc Schoop's process has proved satisfactory. The melted zinc is sprayed by means of compressed air ($3\frac{1}{2}$ atmos.) in an atmosphere of coal gas on to the iron, which is heated to 70° to 80° C. The process may also be used for applying coatings of aluminium, tin, copper, and some other metals. The consumption of tin in Germany is about 21,500 tons per ann., about 70 per cent. of which is lacking, after taking into account the tin recovered from tin-plate waste, etc. For the recovery of this tin treatment with dry chlorine gas has proved the best method, since it converts the tin into chloride, without materially attacking the iron. As a substitute for ordinary solder a mixture of 10 per cent. tin, 10 per cent. cadmium, and 80 per cent. lead is recommended. More recently a cadmium solder containing only 2 per cent. of tin and an antimony solder free from tin have been prepared. In 1913 the world's production of aluminium was 78,000 tons, of which Germany produced 15,300 tons. The impurities in the metal, mainly calcium and aluminium oxide, have now been reduced to about 0·4 to 0·5 per cent. The copper for electric cables has now been replaced by a steel core round which are twisted 6 aluminium strands. Iron has also taken the place of copper for electro blocks for illustrations, and pyrophoric alloys containing about 30 per cent. of iron are used with tinder as substitutes for matches. A saving of leather is effected by the use of steel bands for machinery straps.—(*Ber. deuts. Pharm. Ges.*, 1918, **28**, 26-50.)

COAL OUTPUT OF SPAIN.—The "Boletin Oficial de Minas y Metalurgia" of the Ministerio de Tomento gives the following figures for the output of coal, anthracite and lignite in Spain during the last three years.

	1915. Tons.	1916. Tons.	1917. Tons.
Anthracite ...	222,621	268,093	310,914
Coal	4,135,919	4,847,475	5,024,766
Lignite	328,213	473,106	636,794

—(*Iron and Coal Tr. Rev., May* 10, 1918.)

AUSTRIAN COAL AND COKE OUTPUT.—The Austrian Minister of Public Works publishes the following statistics for the output of coal, coke, etc., in 1917 (as compared with the output in 1916, shown in brackets):

	Metric Tons.	Tons.
Coal	16,729,162	(17,601,708)
Coal Briquettes ...	137,561	(196,709)
Coke	2,618,485	(2,584,674)
Lignite	21,625,949	(23,199,894)
Lignite Briquettes ...	168,699	(225,003)

The figures are for Austria only and do not include Hungary.—(*Iron and Coal Tr. Rev., May* 10, 1918.)

CONTROL OF THE QUALITY OF COAL IN FRANCE.—An Order of the French Ministry of Munitions dated March 23 provides for the establishment in each coal-bearing district of France of an office for the control of the quality of coal delivered. Samples are to be taken and analysed independently of the collieries. The coals of each district have been graded and prices fixed according to the analyses.

The order is intended chiefly to remedy the evil of "dirty coal" supplies, which is also causing great trouble and inconvenience in Great Britain and America. Hence attention is directed to size of coal and ash content. For the best large-piece coal the maximum allowable ash has been fixed at 10 per cent., whilst inferior coals may contain up to 30 per cent. according to their grade. A corresponding price has been fixed for each quality of coal.—(*Gas J., May* 14, 1918.)

THE USE OF COAL IN PULVERISED FORM.—In a paper presented to the American Institute of Mining Engineers H. R. Collins discusses the methods, costs, and advantages of burning coal in the form of powder. All types of coal are available for this purpose, and it is claimed that the expense of erecting and working the necessary pulverising plant is justified by the advantages resulting from its use. These are:—

(1) Greater yield of heat energy per ton of coal.

(2) Reduction of labour for handling coal, stoking, and removing ashes. All the coal is received at one point and thereafter all handling is automatic.

(3) Air and coal are injected at low velocity, thereby increasing life of refractory furnace linings.

(4) Constant furnace temperature may be easily maintained.

(5) A minimum of excess air can be used. The author has obtained flue-gas analyses as high as 17 per cent. CO_2.

The coal is first broken down to a size suitable for drying uniformly before passing to the pulverising mills. Drying the coal renders pulverising easier, and has many other mechanical advantages. The driers are kept at a temperature of 300° F., at which temperature volatile combustible matter is not distilled. The dried coal is passed over a magnetic separator to remove iron, and then enters the mills, where it is ground to a fine powder. The size of the product is such that 95 per cent. will pass through a 100 mesh and 70 per cent. through a 300 mesh sieve.

Feeders for regulating the supply of dust to the furnace are now made quite simple and highly efficient. By suitable regulation temperatures from 1900° to 3000° F. are obtainable.

Coals low in volatile matter require a special furnace, but lignites and bituminous coals do not. Coals high in ash or sulphur may be used quite successfully.

Figures are given for costs, yields, and saving in consumption from actual operations over extended periods. Comparisons are made with other methods of burning coal, and the author concludes that the burning of coal in true pulverised form is the only method by which fuel will develop its full value.—(*Coll. Guard., May* 10, 1918.)

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WATER POWER IN GERMANY.—Professor Dr. Helbfass estimates the available water power in Germany at 11·4 million horse-power, of which only about four millions is yet utilised. In 1910 the proportion utilised was only 5 per cent. of the steam power produced, while in France the percentage reached 40. Hence German industry has an abundant source of power to fall back upon for its future developments.—(*Mar.* 22.)

THE ALSATIAN POTASH DEPOSITS.—The restoration of Alsace to France would put French industry in possession of the valuable deposits of potassium chloride discovered in 1904. Those rich deposits cover an area of 7 square miles to the north-west of Mulhouse. The estimated available quantity is 300,000,000 tons. They could be made to yield an annual output of 800,000 tons, at a low working cost. Already 15 shafts have been sunk; but production has been hindered by legal restrictions arising out of the German potash laws.—(*Mar.* 22.)

SCIENCE APPLIED TO WAR.—The Kaiser has sanctioned the founding of an institute in which men of science will co-operate with the military to discover and develop new means for the purposes of war. The work will be carried on in six departments, namely: (1) Department for chemical raw materials and plant used in the production of munitions; (2) Department for chemical war materials, such as gunpowder, high explosives, asphyxiating gas, &c.; (3) Department for physics, including ballistics, telephony and telegraphy, range-finding, &c.; (4) Department for mechanical transport under war conditions; (5) Department for aeronautics; and (6) Department for the selection and preparation of metals.—(*Mar.* 26.) [*Z. angew. Chem.* 1918.]

MERCURY PRODUCTION.—The world's annual production of mercury is about 4,000 metric tons, of which Spain contributes about 1,400 tons, Italy nearly 1,000 tons, Austria-Hungary 800 tons, and the United States about 750 tons. England's pre-war consumption was over 600 tons; of the 1,600 tons imported about 900 tons were shipped abroad. —(*Chem.-Zeit., Mar.* 27, 1918.)

CARBIDE AS A PROPELLANT.—A trial trip was recently made in an 8-h.p. motor-boat fitted with an acetylene gas producer. The expenditure of energy, measured by a 3-h.p. two-cylinder motor, is 0·7 kg. of carbide per h.p. an hour. The number of revolutions is the same as when pure petrol is used. The apparatus can be used in motors up to 25—30 h.p., and in motor-cars successful results have already been obtained.—(*Verdens Gang, Mar.* 19, 1918.)

DISCOVERY OF GRAPHITE IN RUMANIA.—The German military administration has discovered extensive deposits of graphite near Baia de Fier, in the Rumanian wooded Carpathians. In the Oltetz Valley there is an area of several thousand square metres covered with graphitic detritus, but the mineral occurs chiefly in spathic iron ore, containing 50—70 per cent. of free carbon.—(*Chem.-Zeit., April* 10, 1918.)

RUSSIAN MANGANESE ORE FOR GERMANY.—The great and growing importance of manganese ore in the manufacture of steel has directed German enterprise to the sources of supply in Russia. The centres of the Russian manganese mining industry are in the Caucasus, South Russia, and the Urals. The first is at Tschiaturi in the Kutais Government area, and covers a surface of 57 square kilometres.

A narrow-gauge railway connects Tschiaturi with Scharopan, a station on the Batoum-Poti-Tiflis Railway. Previous to a few years before the war the output was restricted by ox-team transport, but recently railway lines have been laid down in which German enterprise has shared. The estimated quantity of ore available is 30,000,000 tons. The annual output has hitherto been from 500,000 to 600,000 tons, of which quantity Germany took in 1911 by much the larger part. German steelmakers hope that the possession of Batoum by the Turks will enable them to control the whole output. The South Russian source of supply is at Nikopol on the Dnieper, within the domain of the Jekaterinoslaw Government. Here the deposits cover an area of 8,000 hectares, the estimated available ore being 11,000,000 tons. The output in 1912 amounted to 238,500 tons, the greater part of which was used by the ironworks of South Russia; but a considerable proportion was exported to Silesia. The peace made with the Ukraine brings this source of supply within the range of German influence. The third source of manganese ore, in the Ural territory, is as yet unimportant.—(*Stahl und Eisen, April* 4, 1918.)

Fuel Value of Coconut Shells.—An enormous amount of coconut shell is wasted by simply being burnt with other rubbish on plantations or being left to accumulate in stagnant heaps. The suggestion is made that, in view of the fuel shortage in the U.S.A. and other countries, coconut shell be briquetted and utilised for this purpose. A Trinidad factory which uses the shell in its furnaces, together with wood and coal, supplies the following data :—

Average weight of shell: 4 to 6 oz. Equivalents of fuel for a 12-hour day: 3,600 lb. of wood and 300 lb. of shell; 4,000 lb. of wood and 400 lb. of coal; 1,600 lb. of coal and 500 lb. of shell; 1,900 lb. of coal and 150 lb. of wood; 1,200 lb. of shell and 600 lb. of coal.—(*U.S. Com. Rep., Mar.* 7, 1918.)

Mineral Production in the Huelva District (Spain).—The following account is based on a recent report of the Spanish Inspector of Mines: The importance of this district is due largely to the deposits of cupreous iron ore, the output of which rose from 380,396 tons in 1870 to 3,274,269 tons in 1912, while the semi-annual production of the whole district now amounts to 3,000,000 tons, two-thirds of this coming from Rio Tinto. The ore is partially calcined on the spot, sulphuric acid being produced in the process. The works at Rio Tinto has four McDougal furnaces with a capacity of 20 tons daily, and two Glover towers of 160 cub. m. each, the daily acid output being 50 tons.

The foundry for producing blister copper has five water-jacketed melting furnaces of a daily output of 250 tons. The first melting gives a product containing 20—25 per cent., and the second 40—45 per cent. of copper, the mineral being further refined in the transformers. The sulphuric acid (13,599 tons in 1914) and the blister copper produced are, however, insignificant compared with the quantity of pyrites mined, which in 1914 amounted to 2,811,619 tons.

Antimony beds have been discovered in the district, and also arsenical pyrites containing 10—12 gms. gold per ton, as well as layers of iron containing 5 per cent. of titanium. Very rich crusts of auriferous quartz occur; 3 oz. of gold have been found in a half-kilo. piece. The ochre deposited in the Rio Tinto waters is to be made into mineral colours. The deposits of manganese peroxide are practically exhausted, although one mine has recently been re-opened, working an ore of about 30—40 per cent.

Other minerals worked include lead and iron and phosphate and fluoride of lime, while wolfram and uranium also occur.—(*U.S. Com. Rep.*, Feb. 12, 1918.)

The German Iron and Steel Institute.—The fourth meeting since the outbreak of the war of the Verein Deutscher Eisenhüttenleute was held at Düsseldorf on April 14. The Chemical Section has devoted itself chiefly during the last year to the consideration of the consumption of manganese and aluminium, and to the important question of the recovery of low-temperature tar as a by-product of the gas producer. A committee is working out a suitable process for the determination of aluminium in ferro-aluminium. The association is now co-operating with the Standards Committee for German Industry, which was formed last December under the auspices of the Verein Deutscher Ingenieure. It is interesting to note that all the leading technical associations and a large number of individual firms have now joined this committee.

Attention was drawn to the growth of German syndicates under pressure from the Government. Great satisfaction was expressed at the encouragement research had received by the foundation in 1917 of the Kaiser Wilhelm Institute for Iron and Steel Research.

A paper on the Iron Ore Resources of Germany was read by Dr. P. Krusch, and one on Coal Resources by Dr. Böker. The former gave the life of the iron deposits in the important mining areas as from 42—66 years. He pointed out that before the war not one-half of the production of the German ironworks was derived from the native mines. Notwithstanding the large manganese content of certain native ores, Germany would have to be almost completely dependent on imports for supplies of rich manganese ore, and also for nickel, chrome ore, and wolfram. The native resources of molybdenum and vanadium are satisfactory. Under these circumstances the requirements of the iron and steel industry would have to be guaranteed on the conclusion of peace. France could increase the German iron-ore resources without injuring her own industry, as her deposits were three times as large as those of Germany. Russia and Brazil could meet her demands for manganese, Canada and Newfoundland for nickel, Asia Minor for chrome ore, and Spain and Portugal for wolfram ore.

Dr. Böker attached great importance to the coal deposits in Belgium and the North of France for ensuring future supplies of coal, and emphasised their importance for future peace negotiations.—(*Iron and Coal Tr. Rev., May* 3, 1918.)

Water Power in India.—In a paper read before the Royal Society of Arts on April 18 last, Mr. Alfred Dickens pointed out that while the cost of power is always a most important item it is of greater moment in some industries than others, for what would be cheap power to a producer of textiles would be a dear and prohibitive power to a manufacturer of aluminium, nitrates, cyanamide, and such-like commodities. The demand for power by electro-chemical industries will justify the development of many sources of water power previously considered of little or no value. In India the land is in need of fertilisers, and this want can be supplied with the aid of water power, as with cheap electricity fertilisers can now be manufactured from the air at a cost which will enable them to be freely used. The most important installation for utilising water power in India is the Tata Hydro-Electric undertaking, which is to provide approximately 100,000 water horse-power for 3600 hours in each year from valleys which have hitherto been dry for nine months of the year. The catchment area covers 22 square miles, and during the monsoon sufficient rain falls to enable the power referred to above to be obtained. This

has been effected by constructing dams across the three valleys known as Lonalva, Walwhan, and Shirawta, and so forming three large lakes. From the lakes the water is conveyed by an open duct to the forebay and then by steel pipes to the power house at Khopoli. The full scheme provides for eight sets of 12,000 h.p. each. The current is transmitted at high tension to the receiving station at the Island of Bombay, 43 miles away, and is distributed to the cotton mills, which are arranged in groups. Each group has its own feeder, but all are coupled up with an emergency ring feeder. The current is transformed at the mills for use, and the results from adopting electric driving have been very satisfactory. The price charged for current is one halfpenny per unit, which is very low, as coal is three times dearer in Bombay than in England.

The first hydro-electric system in India was installed in 1896 by the Darjeeling Municipality, and prior to the Tata system the most important scheme was that of the Mysore Government at the Cauvery Falls. The power house has a capacity of 22,650 e.h.p., and the current is transmitted 92 miles to the Kolar Goldfields and to the cities of Bangalore and Mysore respectively, 57 and 37 miles distant.

There are also small installations at Bhatti Nadi, Simla, and in the Native State of Kashmir and Jammu. The author advocates the prompt investigation by the Indian Government of the possible sources of water power in the Indian Empire. Private investigation at Messrs. Tata, Sons & Co.'s expense has demonstrated that by constructing a dam across a valley in the Western Ghats, water-power from the Kayna River can be harnessed so as to provide 300.000 h.p. continuously. The author considers this discovery to be of the very highest importance to the whole of the East, for it means 730,000 h.p. for 10 hours for each of the 360 working days of the year, and it is estimated that it can be supplied at one-third of one penny per horse-power hour. India possesses minerals in abundance and the climate and land necessary for a very considerable agricultural expansion, together with a vast and intelligent population. The local capital available is considerable. The financial interests of the West have hitherto been shy of helping forward the development of this source of power, and they did not take advantage of the opportunity they had of being interested in the Tata scheme, to the great advantage of the Indian investor, for it is the only electrical undertaking of magnitude which, in the first year of its working, has earned and paid a dividend on its full capital: although as yet incomplete, it is earning a profit of over £190,000 per annum.

DYE PRODUCTION IN ALLIED COUNTRIES.

United States.—The manufacture of coal-tar dyes in the U.S.A. has been carried on for some 37 years, but prior to 1915 the consumption was over ten times the domestic production. The first step taken to meet the new situation caused by the outbreak of war was to take a census of the imports of dyes on the basis of the year ending June 30, 1914. The results are now well known, and were tabulated in this Journal (1916, **35**, p. 1202). They showed that in all 29,000 tons of dyes were imported annually into the U.S.A.

Since 1914 the American industry has made immense strides. The total capital invested has risen from 3,386,212 dollars to well over 163,000,000 dollars, and this figure is still being augmented. Considerable progress has been made with the crude raw materials, the intermediates, and the finished dyes.

With regard to "crudes," 22 firms reported in 1917 a monthly production of 1,240,350 gallons of benzene, toluene, and some xylol and phenol, and 6,181,600 lb. of benzene, toluene, natural and synthetic phenol, cresol, naphthalene, and anthracene.

A wide range of intermediates is being manufactured, 40 firms reporting a total output of 10,420,600 lb. The list includes toluidine, xylidine, benzidine, tolidine and dianisidine, resorcin, benzyl chloride, benzaldehyde, phthalic, metanilic and sulphanilic acids, paranitraniline, dimethylaniline and the amido-, oxy-, and oxyamido sulphonic acids of naphthalene.

As for the finished colours, a regular supply of coal-tar dyes for all purposes is now available from domestic sources. Forty-six firms report a total monthly output of 5,000,000 lb. during 1917. The range is very wide, dyes of nearly every class and shade being available. Considerable attention is being paid by about a dozen firms to the triphenylmethane series, the monthly production of a few firms amounting to 62,200 lb., including 18,200 lb. of methyl violet. Colours recently introduced include alizarine blues, browns, and yellows for calico printing, para colours for lakes and pigments, synthetic indigo, vat dyes, rhodamine, patent blue, and Biebrich scarlet.

In addition to the above, 13 firms reported a total monthly production of 8,183,500 lb. of vegetable dyes and extracts, including some tanning extracts, not mentioned separately. These colours include blacks and greens for calico printing, logwood blue, khaki dyes, cutch, archil and logwood extract, cudbear, flavines, Osage orange, sumac, and natural indigo. One firm is making sulphur brown on the large scale, while pigments such as Prussian blue, Chinese blue, pigment brown, lakes in all the principal colours, and dry colours are handled by several manufacturers.

Italy.—The necessities of the war having obliged Italian producers of coal gas to make benzene and toluene for the manufacture of explosives, it is expected that after the war these products will serve for the manufacture of dyes. The capacity of existing plant is calculated at the following annual quantities: pure benzene, 12,000 tons; toluene, 2,000 tons; naphthalene, 3,000 tons; phenol, 560 tons; and anthracene, 500 tons. In addition, large quantities of sulphuric acid, oleum, nitric acid, ammonia, chlorine, and soda are being manufactured.

Japan.—Before the war Japan imported dyes to the value of £700,000 per annum, principally from Germany, and her important textile trade suffered greatly when this supply was cut off. To counteract the shortage, the Japanese Government proceeded to subsidise companies engaged in the manufacture of dyes and drugs, under the condition that half the capital of the company should be Japanese; in addition the Government guaranteed a dividend of 8 per cent., with certain reservations with regard to excess profits.

The largest company formed was the Japan Dyestuff Manufacturing Company, Ltd., with a capital of about £816,700. This started operations in June, 1916, on a site of 24 acres. Last year it was producing large quantities of the standard shades of basic colours—blues, violets, and greens; sulphur colours—blacks, blues, and dark blues; and direct colours—blacks, blues, and reds. The company maintains a large research laboratory, in addition to a technical laboratory and an experimental plant.

The Government has also subsidised a company for the production of glycerin and carbolic acid, with a capital of about £120,000, and one for making drugs, with a capital of about £50,000.—(*Bd. of Trade J.*, *May* 9, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Calcium Carbide.

A question put by Captain Carr-Gomm to the Minister of Munitions elicited the following reply from Sir W. Evans:—At no time has the price of carbide been fixed at £40 per ton. From September 24, 1917, to November 20, 1917, the controlled price was £25 per ton, and from that date to December 31, 1917, it was increased to £45 per ton. Since January 1, 1918, it has been reduced to £35 per ton. It is quite true that the Acetylene Corporation of Great Britain, Ltd., could at one time import from Canada and supply its consumers at £27 per ton, but this was before the heavy rise in freight. In order to meet national requirements it has been necessary to place large contracts in Norway, and the controlled rates were based on the average price per ton of the contracts then existing, with a margin to protect against possible loss in transit.—(May 28.)

Basic Slag.

In reply to a question put by Mr. J. Mason concerning the export of basic slag from this country to Ireland while there was a considerable shortage for use in this country, the Parliamentary Secretary to the Board of Agriculture (Sir R. Winfrey) said that although a larger amount of basic slag is now being produced in this country than in pre-war days, the demands for it have increased to a much greater extent, and in view of the extended area of tillage land some shortage may be anticipated. The proportion allocated to Ireland is not more than is justified by Ireland's acreage of tillage.—(May 29.)

Mr. J. Mason asked the President of the Board of Agriculture whether the price of basic slag is based on a flat rate for carriage of 12s. 6d. a ton, and is therefore the same whether delivered in Ireland or at a station near the works of production, and whether the result of this arrangement is that English consumers pay more by 5s. to 10s. a ton than if they paid the actual cost of transport, whilst Irish consumers receive a corresponding subsidy.

Sir R. Winfrey: The price of basic slag includes delivery in Great Britain or to a port in Ireland, but Irish consumers pay, in addition, the cost of delivery in Ireland from the Irish port.—(June 4.)

Steel Production.

In reply to Mr. J. Mason, the Financial Secretary to the Ministry of Munitions (Sir Worthington Evans) said that certain subsidies are given to steel makers to compensate for the increased cost of labour and coal. Rebates are also paid by steel makers to the Ministry in certain cases. These subsidies and rebates enable the price of steel to be stabilised, and thus prevent the necessity of frequently revising contracts involving the use of steel. The effect of this subsidising is to equalise price, and the advantage gained from the equalisation of the price is incomparably greater than any danger that arises from concealing the fluctuations in price.—(May 29.)

Patents in Enemy Countries.

Mr. Higham asked the President of the Board of Trade whether his attention has been called to the Order issued by President Wilson last month prohibiting American citizens from sending money for the maintenance of their patents in enemy countries or for making new application for patents or trade marks, or from sending any communication of any kind respecting patents or trade marks to enemy countries, also prohibiting American citizens from receiving any moneys or documents from enemy countries in respect to American patents or trade marks owned by the subjects of enemy countries; and whether it is the intention of His Majesty's Government to similarly prohibit such communications or payments by or to British subjects, by cancelling the proclamation allowing such payments and communications to be made that was issued in September 1914.

The President of the Board of Trade: I have seen the Order referred to. The question of issuing the existing licences in connexion with this matter was carefully considered by the Board of Trade at the beginning of the war. I will, however, consider whether the action of the U.S.A. Government makes any modification in the policy pursued by His Majesty's Government in this matter necessary or expedient.—(June 5.)

LEGAL INTELLIGENCE.

Process for Purifying Petroleum.—In the Patents Court on May 24, before the Comptroller of Patents, Mr. H. Temple Franks, and Sir Cornelius Dalton, an application was made by the Hall Motor Fuel, Ltd., of Gracechurch Street, E.C., for a licence to use Patent No. 11140 of 1908, stated to be Dr. Edeleanu's patent, comprising a process for purifying crude petroleum (see this J., 1908, 974).

Mr. Moritz, for the applicants, stated that the patent was in the hands of a big German company, the Allgemeine Gesellschaft für Chemische Industrie, of Berlin, and consisted in purifying crude oil by treating with sulphur dioxide in containers provided with agitators. As a chemist he could say that the results obtained surprised him. A licence in regard to the same matter had been granted to the Anglo-Persian Petroleum Company. The applicants asked for a general licence to use the process for general purposes, it being proposed to erect large plant to work the same with a view to the production of an extensive output. All the shareholders of the applicant firm were English or American.

In answer to questions put by the Comptroller, Mr. Moritz said that it was anticipated that the process would be used for medicinal and similar purposes; that it has never been used in this direction before and some risk was attached to the enterprise. It is a new method and a cleaner method, and the supply of sulphur dioxide in bulk is an important element. It will involve considerable alterations to plant and the outlay of a fair sum of money, but it was anticipated that it would prove to be a cheaper process than that now used. It was a war industry at present, but it was intended that it should be an industry after the war. They wanted to be in a position to be able to go ahead and compete in any field.

The Comptroller said that they would recommend to the Board of Trade that the licence be granted, and it would be a licence not restricted to a particular purpose, but a general licence to use the process. The royalty would be at the rate of 6d. per ton, as was fixed when the permission was granted to the Anglo-Persian Company.

The Yorkshire Dyeing Industry.—In the Patents Court on May 29, before the Comptroller of Patents and Sir Cornelius Dalton, an application was made by L. B. Holliday and Co., Ltd., of Huddersfield, for licences to use some twenty odd German patents for dyes and dyeing processes.

Appearing on behalf of the applicant firm, Mr. Colefax, K.C., said that the patents in question were owned by several well-known German firms, including the Farbenfabriken vormals Friedrich Bayer & Co., of Elberfeld, the Badische Anilin und Soda Fabrik, Casella and Kalle. The patents in question were as follows:—Nos. 9122/1911, 19548/1907, 28874/1911, 20132/1906, 12167/1908, 9657/1907, 29750/1906, 14360/1914, 5534/1913, 8127/1910, 1235/1911, 6227/1907, 6228/1907, 20072/1911, 20073/1911, 4656/1914, 25903/1911, 14125/1912, 13455/1914, 8984/1913, 17030/1913, 16698/1912, 28925/1913.

Mr. Colefax said that all these were of very great importance to the dyeing industry, and in regard to some of the patents licences had already been granted to other firms. The present applicants had themselves ventured into the realms of invention and several remarkable colour results had been secured. The firm had now been formed into a limited company with a nominal capital of £250,000, of which £200,000 had been subscribed. They had very large works most suitable for working these patents, and these licences would enable them to manufacture new dyes. They had permits from the Board of Trade in respect of the importation of certain raw materials.

The Comptroller said that, in regard to the royalty, there should be a fixed amount on the quantity produced, so that the royalty should not vary with fluctuations in price, as there was no reason why the patentees should receive increased revenue through the fact of the war sending up the price of material. He was of opinion that the licences should be granted. This firm had applied to the Court before, and there was no question that they had done admirable work already. In regard to the royalty, the rule should be followed that had been adopted before—it would be fixed at 2½% on the final products, and 1% on intermediate products.

PERSONALIA.

The following are among the honours conferred by His Majesty the King on the occasion of his fifty-third birthday, June 3, 1918:—

Baronetcy of the United Kingdom: Colonel E. A. Brotherton.

Order of the Star of India, K.C.S.I.: Sir Thomas Holland.

Knighthood: C. H. Burge, Esq., P. W. Squire, Esq.

Commander of the Bath, C.B. (Civil Division): Sir Hugh Bell.

Order of St. Michael and St. George, K.C.M.G.: Professor J. Cadman.

Royal Victorian Order, G.C.V.O.: Lieut.-General Sir Alfred Keogh.

Promotions in, and appointments to, the Most Excellent Order of the British Empire, for services in connexion with the war:—

Knights Commanders (K.B.E.): Horace Darwin, Esq., Lt.-Col. A. G. Hadcock, Dr. A. C. Houston, H. D. McGowan, Esq., T. H. Middleton, Esq.

Commanders (C.B.E.): Prof. E. C. C. Baly, J. Barcroft, Esq., C. Beck, Esq., C. H. Wordingham, Esq.

* * *

Sir Napier Shaw has been appointed scientific adviser to H.M. Government in meteorology for service in connexion with the war.

Sir Arthur Duckham has succeeded Sir W. Weir as Director of Aircraft Production.

Mr. W. L. Currie, of Glasgow, has been elected President of the Pharmaceutical Society of Great Britain.

GOVERNMENT ORDERS AND NOTICES.

THE COMPOUND FERTILISERS ORDER, 1918.

The above Order, which fixes maximum prices for compound fertilisers, was issued by the Minister of Munitions on June 4, and took effect on and from June 5.

The term "compound fertiliser" means any fertiliser, or substance intended or sold for use as a fertiliser (however described or named), which is manufactured or made by mixing or compounding together, artificially, any two or more separate substances, but it does not apply to the product obtained by treating with sulphuric acid, or any similar reagent, a single substance containing nitrogen, phosphates and potash, or any one or more of such constituents.

"Potash" means compounds of potassium calculated as soluble potassium oxide; and "unit" connotes 1 per cent. by weight in 1 ton of fertiliser.

The basis price is the aggregate value of the nitrogen, phosphates and potash contained in the fertiliser when valued at the respective unit rates detailed in the first schedule; no value is allowed for constituents other than the three specified. The unit rate for nitrogen in Class 1 (comprising sulphate of ammonia, salts of ammonia, nitrate of soda, or other salts of nitric acid, cyanamide, meat, blood, bone, slaughter-house refuse, ground horn, ground hoof, guano, fish offal, fish meal, fish guano, oil-seed cakes or meals, or dissolved shoddy, dissolved wool waste, and dissolved silk waste) is 18s. 6d.; nitrogen derived from all other sources (Class 2) is valued at 7s. 6d. per unit.

Phosphates are grouped in three classes, water soluble, citric soluble, and insoluble, and the unit rates for these are 4s. 3d., 2s. 6d., and 1s. 6d. respectively. Soluble potash is valued at 25s. per unit.

No sales of compound fertilisers may now be effected unless the percentage proportions of the above constituents are clearly given on the invoice, such percentages to be within the limits of error specified in the second schedule.

An additional charge, not exceeding 25s. per ton, for mixing, bags and bagging, may be made in the case of sales f.o.r., etc., at maker's works, and certain extra distribution charges may be levied in the case of sales under 2 tons.

Discounts, which vary with the maximum prices, may be allowed by makers to agricultural merchants, dealers, or to co-operative and certain other societies; otherwise the maximum prices fixed by the Order are net cash prices in maker's or vendor's bags, net weight excluding weight of bags.

The maximum prices so fixed are for sales for delivery during December 1918; in the case of sales for delivery during other months the prices are to be reduced or increased by 1s. 6d. per ton per month, according as the month for delivery precedes or is subsequent to December 1918, but the maximum variation is not to exceed 7s. 6d. per ton.

The Order does not apply to compound fertilisers intended for exportation, nor to fertilisers in quantities exceeding 14 lb. sold for horticultural purposes contained in branded boxes, tins, etc., of capacity not exceeding that weight.

From July 1 next the manufacture and sale of compound fertilisers is restricted to licencees under the Ministry of Munitions, and producers, vendors, etc., must make all necessary returns as ordered by the Minister.

The new Order operates and has effect independently of the Fertilisers and Feeding Stuffs Act of 1906, and supersedes the Orders of October 13 and November 14, 1917.

[The *London Gazette* of June 4 contains the full text of the Order.]

COPPER SULPHATE (AMENDMENT) ORDER, 1918.

The Minister of Munitions issued on June 4 an Amendment to the Copper Sulphate Order, 1918 (this J., 1918, 79R), whereby the maximum prices fixed by that Order (1) shall no longer apply to any such material guaranteed to be specially purified and to contain less than 99 per cent. of copper sulphate, (2) shall apply to finely ground copper sulphate in powder form, with the following additions:—10s. per ton in the case of sales and purchases of 2 cwt. or upwards; ¼d. per lb. in the case of sales and purchases of 28 lb. and over but less than 2 cwt.; ½d. per lb. in the case of sales and purchases of 1 lb. and over but less than 28 lb.

Coal Mines Act, 1911.—The Home Secretary gave notice on June 3 that he made an Order entitled "The Explosives in Coal Mines Order of the 30th May, 1918," the effect of which is to add the explosive Haylite No. 3 to the permitted list.

OTHER ORDERS, ETC.

Cotton (Restriction of Output) Order, 1918. Defence of Realm Regulations, May 17.

Woollen and Worsted (Consolidation) Amendment Order, 1918. Army Council, May 17.

Jute Goods (Prices) No. 2 Order, 1918. Army Council, May 18.

Sheep-Dipping (Devon) Order of 1918. Board of Agriculture and Fisheries, May 28.

Type Metal (Returns) Order, 1918. Ministry of Munitions, May 28.

Sea Island Cotton Order, 1918. Army Council Order, June 3.

PROHIBITED IMPORTS.

By the Prohibition of Import (No. 25) Proclamation of June 4, 1918, the importation, except under licence, into the United Kingdom of the following articles is prohibited:—Fuses, fuse components and parts; motor spirit (including aviation spirit), kerosene (including white spirit), gas oil, fuel oil, and distillates from which any of the preceding can be produced; sugar cane.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, May 23 and 30.)

OPENINGS FOR BRITISH TRADE.

A Toronto manufacturers' agent wishes to represent United Kingdom manufacturers of dyes. Inquiries to the High Commissioner in London for Canada, 19 Victoria Street, S.W. 1.

An agent in Wellington, New Zealand, desires to represent U.K. manufacturers of oils, colours, varnish, and wallpaper. [Ref. No. 134.]

A firm of importers and exporters in Lisbon wishes to obtain agencies for light and heavy chemicals, drugs, and dyes, more particularly for trade after the war. [Ref. No. 136.]

A company recently constituted at Barcelona desires to undertake the sale of British goods in Spain. The goods specified include light and heavy chemicals, disinfectants, fertilisers, skins and hides, asbestos, metals, varnishes, and oils. [Ref. No. 137.]

Match Trade in the Malay States.—Attention is drawn to the market for matches in the Far East. At one time this was largely in the hands of Swedish manufacturers, but recently Japan has captured most of the trade.

The value of the imports and exports of matches into Straits Settlements ports over a period of four years was as follows:—

	Imports	Exports
1913	£112,918	£63,815
1914	102,244	61,903
1915	190,435	120,177
1916	200,876	129,188

The imports came chiefly from the following countries:—

	1913	1914	1915	1916
Japan ...	£99,254	£86,962	£134,339	£162,966
Sweden ...	19,142	8,495	20,679	15,741
Hong Kong...	1,663	5,134	19,053	19,108

The exports go mainly to the Malay States, British North Borneo, Netherlands Indies, and Siam, with the Federated Malay States the largest consumers. It is probable that the matches imported from Hong Kong were largely of Japanese manufacture, being merely transhipped at the northern port.

TARIFF. CUSTOMS. EXCISE.

Australia.—A further Proclamation, dated April 5, 1918, limits the operation of the Proclamation of Dec. 5, 1917, which prohibited the importation of certain petroleum products in tins, to kerosene, petrol, benzine, turpentine, and turpentine substitutes.

The use of the Form of Declaration recently issued by the Commonwealth Customs Dept., as to the home consumption value of goods, which must be printed or stamped on the invoices relating to all goods exported to Australia, will be strictly enforced in respect of goods invoiced after June 30 next.

Canada.—New Customs Decisions relating to the classification of aspirin, powdered Castile soap, etc., have been issued.

An Order in Council of March 8 specifies the standard of quality for baking powders. *Inter alia*, the name of the acid material employed in the manufacture must appear on the label of every brand, and every powder must be capable of yielding 10% of its weight of carbon dioxide.

China.—An Ordinance of the Kwantung Government-General, of Jan. 17, has been issued amending the Ordinance No. 5 of 1915 relating to the control of morphine and cocaine in the leased territory of the Kwantung Province.

Italy.—The exportation of precious stones of all kinds has been prohibited as from May 11 last.

Morocco.—The exportation and re-exportation from the French Zone in Morocco of all raw hides (green, salted, or dried), of leather, tanned or prepared, of oxen, cows, calves, or bulls, has been prohibited.

Netherlands (East Indies).—The exportation of the following articles has been prohibited, except under licence:—Tin, tin ore, quinine, kapok, timber, tobacco, sugar, tea, pepper, coffee, copra, vegetable oils, hides, and petroleum and products thereof.

Peru.—A Law (No. 2727) has been promulgated respecting the revised export duties on Peruvian products. Among the materials affected are:—Sugar, cotton, coca, cocaine, silver and certain of its compounds, copper, vanadium ores and concentrates, tungsten ore or concentrates, molybdenum mineral or concentrate, borates, cotton seed and products, and alcohol distilled from sugar cane.

United Kingdom.—In view of the difficulty of obtaining supplies of wood naphtha, the composition of methylated spirits manufactured on or after June 1 is to be as follows: I. Industrial methylated spirits. (*a*) Ordinary: Wood naphtha, 2%; mineral naphtha, ½%; spirits, 97½%. (*b*) Special: Wood naphtha, 3%; spirits, 97%. II. Mineralised methylated spirits: Wood naphtha, 5%; spirits, 95%, with mineral naphtha ½% and aniline dye (methyl violet) 0·025 oz. for each 100 gals. of spirits added to the mixture.

TREATMENT OF EXPORTS IMMEDIATELY AFTER THE WAR.

Interim Report on the Treatment of Exports from the United Kingdom and British Overseas Possessions and the Conservation of the Resources of the Empire during the Transitional Period after the War. [Cd. 9034.] Price 2d. net.

The following is the brief summary of the conclusions arrived at by the Committee on Commercial and Industry Policy with reference to the future control of exports:—

(1) Any general prohibition of exports to present enemy countries after the war and any continuance of the system of rationing neutral countries are impracticable and inexpedient, but the Paris resolutions can be carried into effect if a policy of joint control of certain important commodities can be agreed upon between the British Empire and the Allies for the transitional period. Any measures should aim at securing to the British Empire and the Allied countries priority for their requirements, and should be applied only to materials which are mainly derived from those countries and will be required by them.

(2) This policy should be applied as regards the United Kingdom by legislation empowering the Government to prohibit the export except under licence of such articles as may be deemed expedient. Under these powers the export of certain commodities which we specify should be controlled, as well as that of any other important commodities, in the case of which it may be found that there is a danger of shortage. The regime should be administered with the help of strong committees on which the trades concerned should be fully represented.

(3) As regards the British Empire and the Allied countries the Government should without delay enter into negotiations with the various Governments concerned, with a view to the adoption of suitable joint measures as regards selected commodities of importance. For this purpose expert committees should at once be appointed.

(4) The Government should consider, in consultation with the Allies, the expediency of establishing after the war a joint organisation on the lines of the Commission Internationale de Ravitaillement for dealing with the orders of the Allied Governments for reconstruction purposes, and with such private orders as they may find it expedient to centralise. In exceptional cases it may be found necessary to adopt a policy of Government purchase of certain important raw materials, the supply of which cannot otherwise be safeguarded.

The subjoined tables give the more important imports into Germany and Austria-Hungary during 1912, together with the percentage proportions of their derivation from the United Kingdom, British Possessions, and Allied countries respectively. These statistics show clearly the extent to which the Central Powers are dependent on products from Allied sources, and it is to the control of these commodities that the report refers.

GERMAN IMPORTS, 1912.

Product.	Value in millions sterling.	Per cent. from United Kingdom.	Per cent. from British Poss.	Per cent. from Allied Countries.
China Clay	0 58	44	—	—
Coal	9·4	87	—	—
Copra	4·7	—	42	—
Cotton (Egyptian) ...	3·4	—	100	—
Cotton Seed	1·7	—	90	—
Cotton Yarns (fine) ...	5·0	91	—	2·8
Flax	3·9	—	—	92
Goat Skins (raw) ...	1·5	3	20	55
Ground Nuts	0·9	—	45	30
Hemp	1·6	—	—	91
Jute	3 7	—	72	—
Lead (ores and metal)	3·1	—	42	21
Linseed	5·2	—	23	22
Manganese Ores ...	1·1	—	29	60
Mica	0·38	9	76	—
Nickel (ores and metal)	0·44	16	—	28
Palm Kernels	4·9	—	89	—
Plumbago	0·5	1·5	67	5
Rapeseed	1·6	—	80	17
Rubber	8·0	—	19	—
Silk (raw and thrown)	7·0	1·1	—	91
Silk (artificial)	1·3	—	—	77
Shellac	0·4	—	93	—
Sulphur	0 23	—	—	87
Wolfram Ore	0·5	21	45	11
Wool (Crossbred) ...	8·7	—	24	25
Wool (Merino)... ...	11·2	—	77	—
Wool (Tops)	4·6	20	—	74
Worsteds (Mohair and Alpaca Yarns) ...	5·3	79	—	—
Zinc (ores and metal)	2·5	—	43	50

AUSTRIAN IMPORTS, 1912.

Product.	Value in millions sterling.	Per cent. from United Kingdom.	Per cent. from British Poss.	Per cent. from Allied Countries
Copra	1·1	—	50	—
Cotton (Egyptian) ...	1·2	—	100	—
Cotton Seed	1·0	—	95	4
Cotton Yarns	1·4	60	—	—
Flax	1·7	—	—	97
Hides (dried)	2·2	—	75	—
Jute	1·2	—	97	—
Manganese Ore ...	0·15	0 7	—	87
Nickel	0·4	20	2	23·5
Palm Kernels	0·7	—	92	—
Rapeseed	0·3	1	36	50
Sesame Seed	0·6	—	72	—
Silk	2·2	—	—	46
Silk (artificial)	0·5	0 4	—	44
Wool	6·7	—	—	27
Worsteds	2·4	51	—	—

COMPANY NEWS.

ALBY UNITED CARBIDE FACTORIES, LTD.

The eleventh annual general meeting was held in London on May 22, Mr. A. E. Barton presiding.

Although the trading profit amounted to only £800 as compared with £63,400 in the previous year, owing to causes beyond control, the income from investments was satisfactory. An increased dividend was received from the A/S Meraker Company which manufactures ferro-alloys, the North-Western Cyanamide Company paid the same dividend (15 per cent.) as before, and an extra £20,700 was received from the company's holdings in Nitrogen Products and Carbide Co., Ltd.

After setting aside £12,000 for depreciation, the net profits amounted to £6,400. The preference dividend is paid, and £14,100 carried forward, but the ordinary dividend is passed. It is anticipated that the next financial period will disclose a much more favourable position.

The buildings and plant at Odde were recently valued at about £770,000 at the current rate of ex-

change, which is over three times the sum which appeared in the books. The company has also a valuable asset in its water-power contract which was secured when labour and materials were cheaper, and there is a general opinion that Norwegian water will appreciate in value. The electrode factory in England was completed a few months ago: about 4,000 tons of its products will be required at Odde, and the balance should be readily absorbed in this country.

TARAPACA AND TOCOPILLA NITRATE.

During the past year the capital has been reduced from £400,000 to £200,000 by the repayment of 10*s.* on every £1 share. All outstanding debentures have been liquidated, and £170,000 has been written off works and properties account, the latter now standing at £152,469. The trading profit was £75,470 (compared with £61,835 in the previous year), and a dividend of 15 per cent. has been declared. In addition, £45,000 has been placed to a contingency account towards developing properties held by the company but at present closed down. Only one oficina—Santa Fé—has been worked during the year. Costs of production are still on the up-grade, and the present selling price of nitrate, 10*s.* 9*d.*, does not leave an adequate profit except in the case of a property like Santa Fé, which commands cheap water-power and possesses good caliche.

SALAR DEL CARMEN NITRATE.

In the last financial year the authorised capital has been doubled, and now stands at £220,000, and new properties have been purchased for £295,390. Practically the whole gross profit of £66,004 was realised on the new properties, and the outlook is very encouraging. (In 1916 the profit was £20,754.) After deducting loss on realisation of investments and £2,791, the total value of stocks of iodine left in Germany, the net profit is £52,552, out of which an interim dividend of 20 per cent. was paid on the old capital, and a final dividend of 15 per cent. is now paid on the new. £10,000 is placed to reserve, and the carry-forward is slightly higher.

Investments of over £100,000 and the reserve account of £90,000 have disappeared from the balance sheet, while the property account has risen from £74,245 to £230,620.

The quantity of nitrate produced in 1917 was 616,180 quintals; in 1916, 380,015 quintals.

NEW PACCHA AND JAZPAMPA NITRATE.

The trading profit in 1916 was £6,200, and the dividend 7½ per cent.; in the past year the profit was £14,600 and the dividend is raised to 15 per cent. The company's debentures have been reduced to £8,000, and if redemption continues at the present rate they will be extinguished in four years' time. The coal bill is a very serious item in the cost of manufacture. Prior to the war 30*s.* per ton was paid for Australian coal delivered in Chile; at the present time about £6 per ton is being given for American coal, and the year's consumption is 8,000—9,000 tons. Stocks of iodine have been realised at a very good price, and the combination has been renewed for another year. The results for the first half of the present year will be satisfactory. The output of nitrate in 1917 was 534,000 quintals, as compared with 380,000 quintals in 1916.

SAN LORENZO NITRATE.

The report for 1917 shows a slight decline in profits, but the dividend is maintained at 25 per cent., free of tax. The outstanding debentures have now been redeemed, £3,204 has been expended on new plant, and the financial position is a strong one. The output of nitrate was about 338,000 quintals, as against 355,100 quintals in 1916.

TRADE NOTES.

BRITISH.

Australia.—Since 1914, sulphate of copper has been imported into Australasia from Japan, and it is thought that the trade will continue after the war. The quotation for a 98% product, February shipment, was £66 per ton, f.o.b. Sydney, as against the British price of £66 per ton, f.o.b. London, less 5%.—(*Bd. of Trade J., May* 9, 1918.)

Ceylon.—The firm of Tata, Sons & Co., of Bombay, will erect oil mills and establish an industrial bank in Colombo. The oil industry will involve a capitalisation of Rs. 85 lakhs, and the bank will be in a position to finance local trade to the extent of Rs. 500 lakhs or more.—(*Pioneer Mail, Feb.* 22, 1918.)

Canada.—A nickel refining company, which has been negotiating for some time for a site on which to erect a refining plant, has decided on the Hull side of the Ottawa River as suitable for the purpose, and plant will be erected at a cost of £200,000. The company will employ at least 150 hands.

FOREIGN.

Norway.—Some time ago a Swedish company was formed for the purpose of acquiring the Bjorkasens copper pyrites mines at Balanger, belonging to a German mining group, and it is now reported that these mines will be worked on a much increased scale. From July this year it is expected that a yearly output of at least 200,000 tons will be obtained. The mines are estimated to contain between six and seven million tons of accessible ore.

During 1917 Norway produced about 230,000 tons of mechanical wet wood pulp, 112,000 tons of chemical dry wood pulp, 40,000 tons of printing paper, and 26,000 tons of packing paper. There was very keen competition in prices with Sweden, owing to the Swedish manufacturers being able to produce at a far lower cost, the price of German coals and sulphate being much cheaper in Sweden than the British materials purchasable in Norway.

The Kjöpsnaes Cement Factory, Ltd., of Narvik, with an annual output of 300,000 barrels, is expected to enter the cement market during the present year.

Spain.—Sulphate of ammonia is wanted in practically every part of Spain. Very large quantities of crude graphite are offered for sale in Bilbao.

It is understood that the local soap factories, four in number, have under discussion a plan for increasing the monthly output, which is now about 385 metric tons. The existing difficulties in obtaining soda, oil, fat, and packing materials constitute the immediate cause of this combine.

Some interesting statistics have recently been published bearing upon Spain's industrial development during the past five years. There are now 60,095 factories, foundries, and mills in the country, including 3,048 chemical works, 4,635 porcelain and glass factories, 1,065 factories for soap and glue manufacture, and 1,345 bottle factories.—(*Kelly's Month. Tr. Rev., April, May,* 1918.)

Japan.—The demand for soda-ash in Japan has greatly increased with the development of the glass industry. Before the war British soda-ash (57—58%) was quoted at 2·50—2·69 yen per 100 lb., but the present quotations are 14·50 yen for the British product, and about 12 yen for the American. Owing to this heavy advance, glass manufacturers are in serious difficulties, with the exception of the Asahi Glass Company and one or two other companies which supply their own soda. The development of the glass industry in this country is handicapped by its dependence on imported soda-ash, but manufacturers have recently made arrangements for increasing the domestic output.—(*Far East Rev., March,* 1918.)

OBITUARY.

SIR ALEXANDER PEDLER.

BORN MAY 21, 1849.——DIED MAY 14, 1918.

It was with great regret that Sir Alexander Pedler's friends heard of his sudden death while sitting at a Committee meeting of the Ministry of Munitions. Although nearly 69 years of age, he was active and alert, and his sudden death was quite unexpected.

Sir Alex. Pedler was educated at the City of London School. In 1866, at the early age of 17, he won the Bell Scholarship of the Pharmaceutical Society, and at that time intended becoming a pharmaceutical chemist. He apparently, however, preferred the entirely chemical side and went to study at the Royal School of Mines, at that time in Jermyn Street. After this he went for a short period to the original aniline colour factory of Perkin and Sons at Greenford Green, where he was one of the chemists who helped my father in his work on the manufacture of alizarine. On leaving the works he returned to the Royal School of Mines, where he acted as lecture demonstrator to Sir Edward Frankland and carried out research work on gaseous spectra in conjunction with Sir Edward Frankland and Sir Norman Lockyer. This evidently influenced his train of thought, because in 1868 he took part in the Solar Eclipse Expedition, and again in 1875 and 1898.

In 1873 he was appointed Professor of Chemistry in the Presidency College at Calcutta, and later on became Director of Public Instruction for Bengal and Vice-Chancellor of the University of Calcutta, besides being additional Member of Legislative Council of the Governor-General of India. While in India his work was mainly administrative, but he found time to carry out some useful work on snake poison, and in 1878 contributed a paper to the Royal Society on the subject of cobra poisoning. This research must have required considerable courage and nerve, and I well remember, when a boy of about 11 or 12, listening entranced to Pedler, who was visiting my father, when on leave, explaining how they held the cobra and irritated it and then held a spoon in front of it over which a leaf was tied. The cobra in its rage bit into the spoon and a drop of the poison fell into the bowl through the pierced leaf.

Sir Alexander had a great dislike of having nothing to do. When he returned from India he said to me, "I hope I shall get something to do; I do not feel like being relegated to sitting in the Park and feeding sparrows." Well, he found plenty to do. The British Science Guild had recently been formed by Sir Norman Lockyer and the Hon. Secretaryship was vacant. Sir Norman asked Pedler to take the post and he accepted. The valuable work which the Guild has accomplished was largely due to Pedler's interest and painstaking labour. The Guild, however, was only one of Pedler's interests; he was director of several companies, and used to spend most of his mornings in the City, frequently devoting the rest of the day to committee meetings of scientific societies.

It was on the administrative side that Pedler excelled, and he was largely responsible for the great success of the Science Section at the Franco-British Exhibition.

He died in harness—a fitting end to an active career. Sir Alexander was married twice, but had no family.

F. MOLLWO PERKIN.

Prof. C. Blarer, professor of chemistry in the University of Bordeaux, died on March 3 last. He was the author of a large number of papers on pure and applied chemistry.

REVIEWS.

TREATISE ON APPLIED ANALYTICAL CHEMISTRY. *By* PROFESSOR VITTORIA VILLAVECCHIA, *Director of the Chemical Laboratories of the Italian Customs. Translated by T. H. Pope. First Edition. Pp.* xvi + 475. *(London: J. and A. Churchill,* 1918.) *Price* 21*s. net.*

As the author states in the preface, the book is the first volume of a collection of methods and standards for industrial and commercial analyses, which have been either officially prescribed or repeatedly tested, and therefore may be confidently adopted. It deals with the analyses of potable waters, chemical products, fertilisers, cement materials, metals and alloys, fuels, tar and its derivatives, mineral oils and fatty substances and the industrial products derived therefrom, all of which have been separately dealt with by specialists.

A glance at the book shows at once that the object has been very creditably attained, and it is very doubtful if the information given could have been more concisely and yet so clearly made available.

The methods given under the different products are few and to the point, lists of alternatives being avoided so as to remove uncertainty in selecting and adopting them.

The chapter on the analysis of alloys occupies about one-third of the book, and, beginning with iron, goes through the analysis of the various forms of steels and ferro-metallic alloys. These are followed by the alloys of other materials which are treated under the metal which forms their main constituent.

The next important chapter of the book is that dealing with fatty substances, the authors of which have taken great trouble to collect all the usual chemical and physical constants together with such usually unknown constants as "Lactone" determination and "Inner" Iodine number. The special part of the chapter deals with vegetable oils, vegetable fats, animal fats, and, last of all, marine animal oils.

The last portion deals with the industrial products obtained from fatty substances—a branch of chemistry usually absent from the more ordinary books on applied chemical analysis. Some of the commoner tests, as the Becchi silver nitrate test for cottonseed oil, is given as Miliau's reaction, although in England it is known under the Italian name.

Other chapters of the book, though giving the information usually sought for, are not so exhaustive.

The book itself is essentially a practical book for laboratory use, and as only selected methods are described, should be of service to chemists wishing to obtain a practical experience of commercial analysis.

The book gives fairly the limits of adulteration and impurities in ordinary chemical products, and the more reliable methods of estimating them.

S. RIDEAL.

A COURSE IN FOOD ANALYSIS. *By* ANDREW L. WINTON. *Pp.* ix + 252. *(New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd.,* 1917.) *Price:* \$1.50 *net.*

Educational works have but indirect interest in chemical industry to the extent that they assist in the training of technical chemists, and this book attempts to provide such training by the substitution of 40 periods of 4 hours each devoted to food analysis for a course of qualitative and quantitative analysis. It is claimed that food analysis methods, being varied, give versatility, and that after those selected have been thoroughly mastered

the analyst should be able to undertake at once the bulk of the work of most food laboratories.

A study of the book fails to substantiate these claims: the methods selected are empirical, the underlying principles are not explained, and the directions are often at fault—e.g. the Reichert-Meissl-Polensky method of determining fatty acids (pp. 157-159); in but one case (p. 206) is the student taught to make a second weighing after driving off moisture, &c., to ensure constancy; important details are omitted, e.g. the test for phosphates (p. 80) contains no indication of the necessity for adding excess of molybdate solution, and some of the short references, e.g. to the Roese-Gottlieb method of determining fat in sweetened milk (p. 30), are positively misleading.

In the microscopical section the student is not taught to observe on such test objects as pleurosigma, nor to recognise and ignore air bubbles and dust particles out of focus; but is plunged *in medias res* with plates excellent in themselves but containing, as a guide, elaborate details that only the experienced microscopist can see. Many of the other illustrations are explanatory of apparatus, but the pictures of common laboratory apparatus such as pipettes, cork borers, flasks, desiccators, &c., seem rather unnecessary.

A redeeming feature of the book is the author's excellent, reasoned description of his method of the determination of water by drying in hydrogen, which might be more generally adopted.

H. Droop Richmond.

What Industry Owes to Chemical Science. *By* Richard B. Pilcher *and* Frank Butler-Jones, *with an Introduction by* Sir George Beilby. *Pp.* 150. *(London: Constable and Co., Ltd.) Price* 3s. *net.*

The scheme of this book is good and is indicated in the introduction by Sir George Beilby, who says rightly that there is no desire to present "a pleasing and literary work which would greatly stimulate the imagination of the reader, but to set forth in their bare simplicity the broad facts of achievement, leaving each case to make its own appeal."

This admirable aim has been thoroughly attained. The joint authors recognise it fully, and in their preface put forward the claim that the work may be of use to many classes of the educated public. It may be said that the claim is too modest. Every man claiming to be educated should understand the whole of this book, and if he does not then he may be dismissed as one uneducated and possibly too old to suffer that process.

To come to particulars. There is shown great industry in both collecting and collating all the essential facts of chemical industry. To take the first chapter: after a short but good description of the history and modern conditions of steelmaking, follows one on the most up-to-date modes of obtaining non-ferrous metals. The rarer metals are not neglected, and, as an instance of the care exercised, citation of the note on p. 21 may be made; this gives as simple and clear an explanation of the nature of an eutectic as could be wished.

Descriptions of the methods of manufacture of heavy chemicals follow, and are as interesting from the historical as from the technical point of view. There is here, as throughout the book, a large amount of historical matter which has caused the reviewer to search his memory and sometimes to be glad that such data are at his service. But when the next edition of this book appears—and that may be soon—he suggests a larger proportion of things in being to those of former days, naturally with an enlargement of the book, as the historical matter could not be spared. As an example, the chapter on rubber might well be much expanded, and the same applies to the two succeeding chapters on cement and on refractory materials. The chapters on refractory materials, glass, enamels, pottery, and porcelain would be improved by the alteration of the ratio of historical to modern practice which has been suggested above.

The chapter on gases is one of the best. Here chemists and physicists meet on common ground, and, as the study of gases was the very beginning of chemico-physical science, a full and interesting historical account is entirely in place. It is accurately balanced by a description of modern developments in the preparation and utilisation of gases in industry.

The book is a good one and much wanted. It contains information accurate in itself and clearly stated. The authors are to be congratulated.

Bertram Blount.

PUBLICATIONS RECEIVED.

The Alkali Industry. *By* J. R. Partington. *Pp.* 304, 63 *illustrations. (London: Baillière, Tindall, and Cox.) Price* 7s. 6d.

Plant Products and Chemical Fertilisers. *By* S. Hoare Collins. *Pp.* 236. *(London: Baillière, Tindall, and Cox.) Price* 7s. 6d.

Textbook of Inorganic Chemistry. *By* R. M. Caven. *Pp.* 468. *(London: Charles Griffin and Co., Ltd.) Price* 15s.

Bulletin of the Imperial Institute. *Edited by the Director and Prepared by the Scientific and Technical Staff of the Imperial Institute, and Others. Vol.* xv. *No.* 4. *Oct.-Dec.* 1917. *Pp.* 620. *(London: John Murray.) Price* 2s. 6d.

Sir William Ramsay. *By* Sir W. A. Tilden, F.R.S. *Pp.* 311. *(London: Macmillan and Co., Ltd.) Price* 10s.

Dyeing and Cleaning. *By* Frank J. Farrell, M.Sc. *Pp.* 253. *(London: Charles Griffin and Co., Ltd.) Price* 6s.

Rubber: Its Production, Chemistry, and Synthesis. *By* A. Dubosc *and* Dr. A. Luttringer. *Pp.* 383. *(London: Charles Griffin and Co., Ltd.) Price* 21s.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, &c., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to accept relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

SOME PROBLEMS OF THE PLANTATION RUBBER INDUSTRY.

H. P. STEVENS.

On a first visit to the East about ten years ago the writer spent a few weeks on one of the largest plantations in the Malay Peninsula, having been commissioned to undertake an investigation to determine the best method for the production of plantation rubber. This was in the early days of the plantation industry and the older estates were coming into bearing, producing a few hundred gallons of latex daily. The coagulation of latex had been studied in Ceylon by Parkin, who had recommended the use of acetic acid. His choice of an organic acid in preference to a mineral acid proved to be a fortunate one, but he considerably over-estimated the proportion of acid necessary for coagulation. At this time some estates, for fear of using too much acid, were doing without acid altogether and relying on the so-called natural coagulation. This method of "natural" or spontaneous coagulation yields a satisfactory product, but at that time it was neither economical nor convenient. Latex left in large tanks with loose covers takes varying periods to coagulate, and the coagulation is more or less incomplete, so that some latex is lost in the subsequent washing operations. The morning after coagulation the whole factory is permeated with an unbearable stench caused by the putrefaction of the non-caoutchouc constituents of the latex.

More recently, the method of spontaneous coagulation has been revived and modified by allowing the coagulation to be carried out under anaerobic conditions. It is known that when latex is coagulated spontaneously and exposed to the air the interior of the mass acquires an acid reaction brought about by lactic acid fermentation, while the surface develops a yellowish alkaline slime in which coagulation is very imperfect. According to the most recent work, carbon dioxide gas given off from the mass is retained on the surface in the anaerobic process, and this prevents the putrefactive changes which give rise to the alkaline slime. The evidence at present appears to be in favour of an enzyme action as the primary cause of coagulation, although sufficient lactic acid soon develops to bring about coagulation in the ordinary manner. The subject requires further investigation, particularly with a view to ensuring complete coagulation within a reasonable time.

If the anaerobic process can be relied on to produce *regular* and complete coagulation within, say, twenty-four hours, the process has a future, and should eventually displace coagulation by acetic acid, at any rate for bulk coagulation in the manufacture of crêpe rubber. The appliance for closing the vessel with a water seal is simple, and the extra cost would probably be small. Also the cost of the acid is saved and the trouble of adjusting the proportion of acid to the latex.

When the writer first visited the East there appeared to be no advantage attached to the method of "spontaneous" coagulation, particularly as he found that rapid and complete coagulation could be obtained with a very small proportion of acetic acid—about one part per thousand of diluted latex. Moreover, the coagulation was clear and the resulting rubber pale and more even in appearance than that produced by spontaneous coagulation. The market has always paid a small premium for such rubber. It has the appearance of having been more carefully prepared, and any particles of bark or other adventitious matter are easily detected. With the same end in view, small quantities such as 1 to 2 parts per 1,000 of sodium bisulphite are commonly added to the latex which inhibits the action of the oxydase present. This would otherwise produce a darkening of the surface of the coagulum, and eventually dark streaks or patches in the finished rubber. The bisulphite is without appreciable effect on the quality of the rubber, but it is questionable whether a pale, even coloured, rubber is the best that can be produced, whatever method be adopted to prevent the darkening. Research carried out in recent years has shown that this pale rubber cures more slowly than a darker and less attractive looking material which has been prepared by setting the coagulum aside for a few days to putrefy before washing and "crêpeing." The putrefactive bases so formed accelerate vulcanisation. This is an advantage to the manufacturer, as a more rapidly vulcanising rubber means a larger output with the same vulcanising plant. Yet, however, the extreme limits of rate of cure may have but little effect when the rubber is compounded. Also the manufacturer can add his accelerator, and usually does so. It is doubtful whether, for this reason, an appreciable advantage attaches to a fast vulcanising rubber in the great majority of technical mixings at present in use. For instance, is an appreciable reduction in the time of vulcanisation obtainable by the use of a rapidly vulcanising rubber in the manufacture of a staple article such as a solid tyre? Some fast curing rubbers are troublesome to mix when much litharge is used, as vulcanisation tends to set in on the mixing rollers.

It is stated that a large up-to-date American plantation in Sumatra produces no pale crêpe, but only a rapidly curing rubber of less attractive appearance on the lines indicated. This would seem to show that such rubber has advantages to the manufacturer. Unfortunately, the adoption of such a process on British owned plantations is a more difficult matter, as the rubber is not sold directly to the manufacturer. The difficulty is therefore commercial rather than technical. It is often stated that rapid curing rubber is of better quality than the pale coloured product. To produce the technical effect of vulcanisation it is necessary to heat the mixture of rubber and compounding ingredients, and it is argued that the heating detracts from the beneficial effect of vulcanisation. The argument is based on the known fact that heating rubber by itself to vulcanising temperatures damages it. If this is so, the shorter the period of heating the better the product, provided an equal degree of vulcanisation is produced. There is some evidence of a general nature to support this view, but conclusive experiments to this end have not been published.

Similar considerations may be applied to organic accelerators added to the rubber in the course of manufacture. There is reason to believe that technical development on these lines has reached a more advanced stage in American factories than in Great Britain. One authority who carried out a great deal of work with accelerators goes so far as to state that a good accelerating reagent must not only facilitate vulcanisation but should also toughen the rubber and render it immune from deterioration.

Variation in rate of cure of *Hevea* rubbers must certainly be ascribed to a variation in the nature and proportion of the non-caoutchouc ingredients. The insoluble nitrogenous matter commonly referred to as the protein matter facilitates the combination of the rubber and sulphur, as is shown by the effect of its removal from the rubber. On the other hand, the putrefactive bases are far more active. It has been suggested that the fresh latex contains a substance having an accelerating action, presumably in addition to the insoluble nitrogenous matter and the putrefactive bases. It has not, however, been isolated, and nothing is known of its composition.

The ever increasing supplies of plantation rubber

have rendered the collection and marketing of the inferior grades of wild rubber unprofitable, but the supplies of fine Para have not diminished, and this rubber has for years commanded a premium over the best plantation grades. This is the more remarkable as the former requires to be first washed and dried, in which process it loses about 20 per cent. of its weight. Standard plantation can, on the other hand, be used for the majority of purposes without preliminary treatment. Those who have made comparative vulcanising tests are also agreed that fine Para does not give a stronger vulcanised product than plantation, nor does it vulcanise very rapidly. Where, then, does it possess the advantage over plantation, and why does it command a 30 to 40 per cent. premium in the market? It is claimed that fine Para is less variable than plantation, but this is open to question, at any rate if fine Para be compared with regular consignments of any of the best marks of plantation. It is also admitted that fine Para shows some variation.

The explanation is probably to be found in hesitation on the part of the manufacturer even now to employ plantation rubber for purposes where the cost of the rubber is a relatively small item in comparison with the value of the product. Take, for instance, the case of a submarine cable—the manufacturer cannot tell until years have elapsed whether the plantation rubber has been suitably mixed and manufactured to give the length of life necessary and obtainable under *known conditions* with Brazilian Para. This preference for fine hard Para might have been avoided had a thorough investigation of the properties of fine Para and plantation rubber been undertaken from every standpoint. Such a research is urgently needed.

A NEW FORM OF FRACTIONATING COLUMN FOR LABORATORY USE.

H. FRANKLAND TAYLOR.

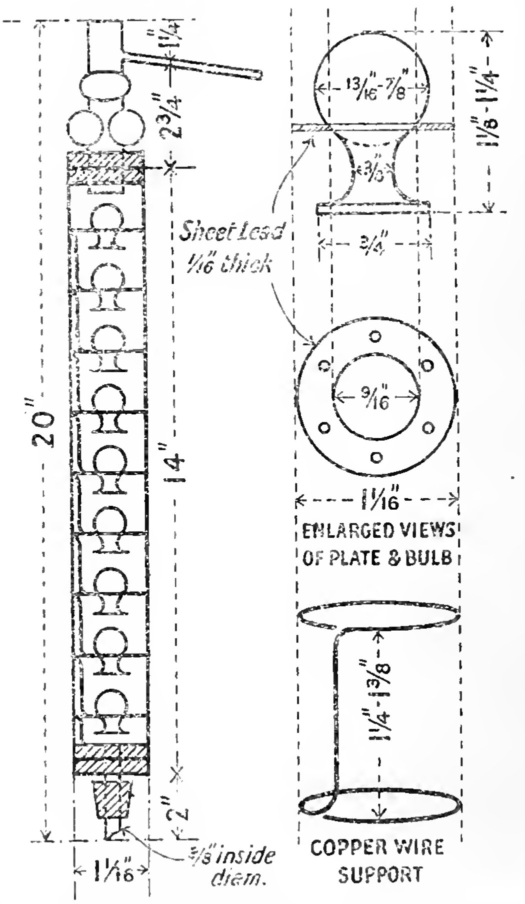
Construction. The column consists of a glass tube 14″ long and $1\frac{1}{16}''$ diam., containing nine lead discs $1\frac{1}{16}''$ diam. supported horizontally at equal distances by copper wires arranged as shown. These discs have a central hole, $\frac{9}{16}''$ diam., which is surrounded by about seven small perforations. A glass bulb about $\frac{13}{16}''$ diam. rests over the central hole. This bulb is blown on the end of a short piece of glass tubing ($\frac{3}{8}''$ diam. outside) which passes through the hole, and has its lower end widened out so that it will not pass through if the column be inverted. When used with liquids of low boiling point, efficient working can only be ensured if the following conditions are satisfied:—

(1) The edges of the central hole must be even, so that the bulb will touch the lead all round.

(2) Both loops on the copper wire supports must spring tightly against the glass. The lead plates need not then fit very closely, and can therefore be more easily fixed in position.

The other details of the construction may be gathered from the diagram. It is proposed to call the apparatus the "Plate and Bulb Column."

Modus operandi. The liquid which is condensed by air cooling on the sides of the column does not run down through the small holes in the lead discs owing to the upward pressure of the vapours, and therefore accumulates in each section, the ascending vapours being forced to bubble through it. As the liquid accumulates the pressure of the ascending vapours increases until it becomes sufficient to raise the bulb from its seating. The returns then run down through the central hole, until, the pressure being released, the bulb falls back and closes it. More liquid now accumulates, and the bulb is presently raised again. This cycle of operations takes place very rapidly (many times in a second). In a column constructed to the dimensions given, about $\frac{1}{8}''$ of liquid collects in each of the



nine sections, and the vapours, in their passage through the column, get thoroughly scrubbed by the descending returns.

As the relative volumes of vapour and of returns are necessarily functions of each other, it follows that the extent to which the central hole is opened by the vapours is always just sufficient to allow the returns to flow down, whether the amount of these be large or small. Many forms of column, however, if constructed to work efficiently on low boiling liquids, become choked by the large quantity of returns when used for high boiling liquids; but in the Plate and Bulb Column the larger quantity of vapour which must accompany the larger quantity of returns causes the bulb to be raised more often, so that the returns can pass down. The same column has been found to work efficiently on liquids boiling as low as 46° C. and as high as 200° C.

The sections may be made to hold an increased amount of liquid by weighting the bulbs with a small piece of lead wire, or by increasing their size; it is therefore advantageous to make the upper bulbs slightly larger than those below.

Comparison of Fractionating Columns. A series of comparison tests was performed to compare the new column with other columns, and also to determine the relative efficiency of the fractionating columns in general use.

(1) Separation of Carbon Bisulphide and Benzene. 100 c.c. of a mixture of equal volumes of carbon bisulphide and benzene was distilled through the

column under examination at a speed of 3½ c.c. per minute, until 45 c.c. had collected. The percentage of bisulphide in this fraction was then determined from the specific gravity by means of a graph, which was constructed in the following manner :—

Mixtures containing 70, 75, 80, 85, 90, and 100 per cent. of bisulphide were prepared by mixing together the necessary quantities of carbon bisulphide and benzene, delivered from burettes. The specific gravities of these were determined by means of a balance, and the results, when plotted on squared paper, gave a graph from which the percentage of bisulphide in any mixture within the limits could be read to 0·1%. An error of ·001 in the specific gravity caused an error of 0·2% in the percentage of bisulphide.

(2) Concentration of Alcohol. 200 c.c. of a mixture of 1 part methylated spirits (94·7% alcohol) and 1 part water was distilled at the rate of 3½ c.c. per minute until 95 c.c. had been collected. The percentage of alcohol in the distillate was determined from the specific gravity.

(3) Separation of Toluene and Pyridine. 100 c.c. of a mixture of equal bulks of toluene and crude pyridine was distilled at the rate of 3 c.c. per minute until 45 c.c. had been collected. The percentage of toluene in the distillate was determined by shaking with three successive quantities of dilute sulphuric acid in a burette (to remove the pyridine bodies), and reading off the volume of residual toluene. The crude pyridine used contained roughly 40 per cent. of the pure base, the remainder consisting chiefly of the lower pyridine homologues. It was free from water and completely soluble in dilute acid. As there is only about 5° difference in the boiling points of toluene and pyridine the separation is very imperfect in this test.

Great care was taken in all the comparison tests to maintain a uniform rate of distillation. The speed was tested every minute or two. Temporary variations were seldom more than 1 c.c. per minute and the average speed was always within ½ c.c. per minute of that specified. The figures given in the table represent the mean of two tests differing by not more than 0·5 per cent., except where otherwise stated.

Fractionating Column, etc., used.	Total length.	Bisulphide and Benzene. % CS_2 in distillate.	Toluene and Pyridine. % Toluene in distillate.	Alcohol and Water. % Alcohol in distillate.
Retort	—	69·9	—	—
Flask without column	—	70·6	62·6	—
Glynsky's column ...	15¼″	74·2	—	—
Young's Rod and Disc column ...	20″	78·6	—	—
Young's 12 Pear column	23″	79·4	70·0	88·4†
Young's Evaporator Still Head	20½″	—	—	83·0†
Le Bel Henniger. 4 bulbs	20″	80·1	71·5*	88·1‡
Hempel or Bead column. 7½″ beads	21″	86·1	73·0	—
Hempel or Bead column. 12″ beads	21″	89·7	—	—
Two Le Bel Henninger columns (8 bulbs altogether)...	36″	91·1	—	—
"Plate and Bulb" column	20″	90·6	75·6	91·0

* Two tests, 71·1 and 71·9. † One test only.
‡ Two tests, 87·7 and 88·5.

Notes on the columns used. The Evaporator Still Head had three compartments, and the glass tubes inside were fixed to the sides by small points of glass.

In the Le Bel Henninger columns care was taken to have the gauze cups fixed firmly into the constrictions. In the 8-bulb column the tube between the two sets of bulbs occupied 7 in. of the total length. The beads used in the Hempel columns were of $\frac{3}{16}''$ to $\frac{1}{4}''$ diameter, and the tube holding them of $1\frac{1}{16}''$ diameter.

Tests were also made with another Young 12-pear column in which the constrictions between the pears were of greater diameter, and the pears slightly smaller and less well shaped. In this case only 86·4 per cent. of alcohol was present in the distillate.

THE MINERAL WEALTH OF SPITSBERGEN.

The statement of German aspirations with regard to Spitsbergen has focussed attention on this comparatively little known part of the Arctic, and this attention is likely to be considerably increased as its resources become more widely known.

The country consists of a group of islands, having a combined area about equal to that of Ireland. While its northern and eastern portions are mainly unproductive, the action of the Gulf Stream, which laves its western coast, is responsible for temperatures higher than those encountered much further south, and as a consequence the vegetation in the valleys is luxuriant in the summer and work can proceed all the year round. Its waters are open for shipping for about six months of each year, but it is anticipated that, with suitable appliances, this period could be considerably extended, probably to nine or ten months.

Until the latter part of the nineteenth century Spitsbergen was looked upon as of little or no account, but the work of geologists and prospectors, and developmental progress of recent years, have disclosed the existence of mineral wealth of great value. The principal known deposits of economic value are coal and iron ore, but these, while of great extent, form but a part of the wealth now to be made available, if properly administered, for the advantage of the world at large.

The coal areas of Spitsbergen extend over (approximately) 2000 square miles, the seams varying from two to twelve feet in thickness. They outcrop in the mountain side at from 250 to 800 feet above sea level, and many of them are situated within easy distance of deep-water inlets from the open sea. The varieties located up to the present are mainly anthracitic and bituminous; cannel coal has also been found. Specimen analyses from three localities are as follows :—

Location	Fixed Carbon.	Volatile Matter.	Sulphur.	Ash.	Moisture.	Calories per Kilo.
Lowe Sound..	82·88%	9·97%	0·63%	6·52%	0·63%	7,782
Bell Sound ...	46·61%	48·15%	0·71%	5·23%	5·34%	7.233
Advent Bay ...	57·28%	38·44%	0·76%	2·83%	1·44%	8,014

The first two specimens were obtained from deposits which are British-owned, the last from territory in the possession of Norwegians.

The greater part of the known coal-bearing land is claimed by British subjects; Norwegian, Swedish, and Russian interests are also active, and there is little doubt in the minds of those having knowledge of the country, that from its nearer proximity and abundant supply, Spitsbergen is destined to become the source from which the coal requirements of northern Europe will be drawn.

The iron ore deposits consist of hæmatite, found on land adjoining a good harbour inside Prince Charles Foreland, and magnetite, found in the neighbourhood of Recherche Bay. The hæmatite deposits have not yet been fully traced, although there is more than enough ore in sight to justify them being described as a payable proposition. The ore is from medium to high grade, containing over 50% of metallic iron. A typical analysis shows :—Ferric oxide 71·42%, alumina ·69%, manganese

oxide ·28%, sulphuric anhydride ·034%, phosphoric anhydride ·138%, and silica 25·10%; loss on calcination and not estimated ·868%.

The magnetite occurs in a range of mountains, situated on the east side of Recherche Bay, a sheltered bay with deep-water anchorage within half a mile of the edge of the deposit, which, it is believed, extends over about 29 square miles. Débris, ready for collection and shipment, is scattered all along the range (this alone is computed to amount to many millions of tons) and is identical with material obtained from fast rock. Analyses of the ore have been made by firms of standing in London, Birmingham, Sheffield, and Middlesboro'. While space does not permit of these being quoted in detail, the following typical analysis, made from 50 samples bulked, gathered over a distance of about 10 miles along the range, may be cited:—

Metallic Iron	Silica	Sulphur	Phosphorus	Moisture
64·44%	6·29%	0·101%	0·015%	0·12%

Other analyses show a range of from 59·68 to 68·91% of metallic iron, all with low phosphorus and sulphur. Copper, chromium, nickel, arsenic, vanadium, titanium and barium were also tested for; in all cases these were either absent, or present only in minute traces.

Extensive deposits of coal, suitable for smelting purposes, occur in close proximity to the magnetite deposits, the hæmatite lying some sixty miles further north. All of these are near the sea, in well sheltered bays, where loading facilities can be provided at small cost. There is no reason why, in addition to exporting the coal to ready markets, the extraction and exportation of by-products from suitable coal should not be proceeded with, as well as the smelting and conversion of the ore into pig iron and steel billets, suitable material for fluxing purposes being available near by. According to estimates that have been carefully drawn, this is both practicable and profitable, and the saving of freight would be considerable. In this connexion, it may be mentioned that experiments recently made in London with Spitsbergen magnetite, by a process shortly to be worked on a commercial scale, have demonstrated the suitability of the material for conversion into steel direct, the product (a high-grade steel) having successfully passed all the tests to which it was submitted.

Marbles of great variety, many of them of brilliant colouring, are found in King's Bay, Cross Bay, and elsewhere. They are mainly dolomitic in structure, are suitable both for constructional and developmental purposes, and sufficient in quantity to replace the ravages of war throughout Europe. Deep water prevails alongside many of the deposits. Massive beds of gypsum have also been located.

Another interesting discovery made of recent years is that of an extensive deposit of guano on the south side of Bell Sound, where millions of birds have congregated for centuries past. The deposit is estimated to contain over 130,000 cubic yards of guano. As mined, the material contains over 62% of water, but evaporation speedily takes place, and, on reduction to a water content of 15%, shows a content of nitrogen 1·82%, phosphoric acid 9·50%, potash 0·45%, and lime 6·48%. The deposits extend right down to the shore, where there is a good harbourage, with deep water alongside—another remunerative industry, only awaiting exploitation.

There seems to be no end to the surprises that are encountered in Spitsbergen. For instance, a specimen of zinc blende, obtained in 1914, gave on analysis the astounding result of:—Zinc 50%, sulphur 22·36%, silica 19%, magnesia 1·8%, iron oxide ·57%, alumina ·63%, and oxygen (in combination with part zinc) 3·14%. The extent of the deposit has yet to be proved.

Other minerals that have been located, but not yet developed, include iron and copper pyrites, molybdenite, graphite, galena, and copper ore. Malachite has also been seen, but not to any great extent. Gold is reported to have been found as alluvial in Horn Sound, but no attempt has as yet been made to trace its origin.

When the vast richness of the mineral deposits of Spitsbergen is taken into consideration, it is little wonder that Germany, faced with the possible loss of Alsace and Lorraine, and the evacuation of Belgium, should cast longing eyes on these comparatively undeveloped sources of wealth, if only for the coal and iron ore. She is, however, forestalled. The principal coal areas are already claimed by British, Norwegian and Swedish companies, the holdings of the first-named being far greater than those of all others combined, both as to extent and value. The iron ore and marble deposits are entirely British owned, as are most of the other minerals. While the war has greatly retarded their exploitation and development, it is of importance that its occurrence (which, after all, is incidental) should not risk the possible loss of this wealth to the British Empire.

Spitsbergen, apart from the workers taken out by the various companies operating in the country, has no resident population. It is at present under no flag and is controlled by no law; while attempts have been made to establish some kind of internal administration, no agreement has as yet been arrived at. The country is regarded as a "No Man's Land," but its administration, on an assured basis, will become an absolute necessity when the exploitation of its wealth is taken seriously in hand.

Germany, with Russia as her forced tool, is now attempting to obtain control, and this must be prevented at all costs. Her possession of Spitsbergen (lying, as it does, only 370 miles north of the Scandinavian mainland), or, to adopt her euphemistic phrase, its "organisation . . . in accordance with the German proposals," would be a standing menace to civilisation. Neither from a political nor from an economic standpoint can German control of the mineral wealth of Spitsbergen be tolerated: strategically, her possession of a naval base capable of dominating Northern Europe, situate within about 1000 miles of the Shetland Islands, and having free access to the western ocean, would probably result in a catastrophe greater than that which has followed the cession of Heligoland, and might well alter the balance of power throughout the world.

Relative Efficiency of Motor-Fuels.—In a newly-published book "Die Treibmittel der Kraftfahrzeuge," by Donath and Gröger (Berlin, Springer, 1917), an account is given of experiments with different motor-fuels recently carried out in Germany. The following were some of the results obtained:—

Petrol, pure	5·8 km. per litre
Benzol, pure	7·1 ,, ,,
1 Benzol + 1 Alcohol	7·5 ,, ,,
1 ,, + 2 ,,	7·2 ,, ,,
1 ,, + 3 ,,	7·0 ,, ,,
1 ,, + 4 ,,	6·6 ,, ,,
1 ,, + 5 ,,	6·0 ,, ,,
Alcohol, pure	5·4 ,, ,,

(*Teknisk Ukeblad, Christiania, April*, 1918.)

Madagascar as a Source of Raffia Wax.—The Madagascar raffia wax industry is as yet undeveloped, but it is believed that 10 tons of the product would be available annually. Raffia wax is a substance resembling carnauba wax, and is made from the dust beaten from the leaves of the raffia palm and afterwards boiled to a creamy consistency. It sets hard on cooling.—(*U.S. Com. Rep., April* 1, 1918.)

NEWS FROM THE SECTIONS.

LONDON.

The last meeting of the session was held on June 3, Dr. C. A. Keane being in the chair. After the Hon. Sec., Dr. S. Miall, had read the report of the work of the Section for the past year, Dr. H. J. S. Sand gave a description and demonstration of his cadmium vapour arc lamp. This lamp is very similar in principle to the mercury vapour lamp, but differs from it in affording a more complete optical characterisation of a substance under examination. Since cadmium is solid at the ordinary temperature the envelope of the lamp is made of silica glass in order that it may stand the heat of a Bunsen burner, which has to be applied to melt the metal. Many difficulties were encountered in the construction of the lamp, *e.g.*, that of finding a satisfactory vacuum-tight seal for the leading-in wires, obtaining the metal free from oxide, etc., and preventing adhesion of the solid metal to the glass; the last of these was overcome by the introduction of fine zirconia powder. In addition to its use for optical measurements, the lamp is expected to be of value for therapeutic purposes.

The second paper was by Mr. A. R. Powell on "The Estimation of Tin in high-grade Wolfram ores and the use of Lead as a reducing agent in Pearce's assay." For the isolation of small quantities of tin in rich wolfram ores four methods were referred to, the first two being well known and the second two having been worked out by the author. In the older processes the ore is boiled with aqua regia, the insoluble tin and tungstic oxides filtered off, extracted with ammonia, and the residual tin oxide fused with sodium peroxide and the assay continued in the usual way; or the ore may be fused with cyanide and the residual tin-iron metal dissolved in hydrochloric acid and the solution reduced and titrated in the ordinary way. In the first method proposed by the author, the ore is fused with sodium peroxide and the melt dissolved and made up to a known bulk An aliquot portion is filtered off and the tin separated either by boiling the alkaline solution with ammonium nitrate, or the alkaline solution is acidified with tartaric acid and a little hydrochloric acid and the tin precipitated by sulphuretted hydrogen In the second method the ore is fused with bisulphate and the melt boiled with tartaric acid, which dissolves everything except tin oxide and gangue, and the insoluble portion is filtered off and fused with peroxide. Copper, bismuth and molybdenite are removed by a preliminary nitric acid treatment and ilmenite, columbite and monazite do not interfere. The method is very quick and when combined with the zinc-lead or zinc-iron reduction about 16 to 20 assays can be done in an hour. The author has found that stannic chloride solutions can be reduced satisfactorily by lead or zinc-lead instead of the usual iron or nickel. The advantages are that a colourless solution is obtained, no blank is required and the lead need not be removed before titrating.

In the Report of the Session above referred to, it is stated that the membership numbers 1139 as against 1029 in the previous year, an increase of 110. The Section has lost 12 members by death, 11 by transference to other Sections, and 2 by resignation. Owing to the formation of a West of England Section a further loss by transference is anticipated, as all members residing in that part of the country were formerly registered as London members.

Seven meetings were held during the past Session and the attendance was very satisfactory. The new rules adopted by the Section have been formally approved of by the Council of the Society.

The British Empire Sugar Committee has collected much important statistical information and expects to issue a report early in the new Session. The Section has also appointed a committee to investigate the various types of filtration and the problems connected therewith.

In the summer of 1917 a Chemical Club was formed for members of the Section and several successful meetings have been held. The Club is now in process of re-organisation and is no longer confined to members of the Section.

The Chairman and the Hon. Secretary have been re-elected, and the following are the new members of the Committee:—Messrs. Julian L. Baker, A. E. Berry, R. B. Brown, C. J Goodwin and James C. Philip. Messrs. T. D. Morson and F. I. Scard, who retired, being eligible, were re-elected.

MEETINGS OF OTHER SOCIETIES.

THE SOCIETY OF BRITISH GAS INDUSTRIES.

The presidential address recently delivered by Sir Robert Hadfield was one of remarkable interest, but as it covered such a large variety of important topics no more than a summary of the contents and brief references to certain outstanding features is possible. The address was divided into eight sections, dealing with fuel, gas, fuel and electrical power, consumption in relation to steel output at the Hadfield Works, metallurgy, education, commerce, patents, and the need for new buildings and library to meet the modern requirements of British technical societies.

Very interesting data were given of the fuel and electrical power consumption at the three large Hadfield works, figures which illustrate not only the remarkable output by this one firm in wartime but the prodigous expenditure of coal involved. Coal consumed in 1917 was 158,100 tons; coke 27,900 tons. In addition coal gas and electricity were drawn from public supplies: 300 million cub. ft. of coal gas, 3780 million cub. ft. of producer gas, and 54·75 million units of electricity were used in 1917.

Valuable practical figures of fuel consumption from actual working results were presented, which are summarised below:—

To Heat 1 Ton of Steel to 900° C.

	Fuel or energy consumed.	Heat efficiency.	Equivalent tons of coal
Coal	0·08 ton.	23%	0·08 ton
Gas	2750 cub. ft.	32%	0·23 ton
Electricity ...	300 units	54%	0·38 ton

To Melt and Finish 1 Ton Fluid Steel.

Crucible... ...	2·5 tons coke	1·4%	3·75 tons
Open hearth ...	0·3 ton coal	13·5%	0·30 ton
Electricity (to melt) ...	515 units	68·0%	0·66 ton
Electricity (to melt and refine)	780 units	47·0%	1·00 ton

Coal heating shows by far the best results, but with coal gas the coke and by-products are an offset. With electricity again (which is very expensive in fuel) there are advantages, such as greater efficiency of the furnace, better control, and ability to use certain raw materials and small scrap. Sir Robert Hadfield points out that Sir Wm. Siemens' prediction in 1880 that with electricity 1 lb. of coal is capable of melting 1 lb. of steel, has been realised in practice in 1917.

In the section on education a useful summary of the universities, colleges, and technical schools of the world was given. In Great Britain and Ireland there is one university to 2·5 million inhabitants; in France about the same provision; in the U.S.A., one to the million; in Germany, one to about 3 millions, but in addition there are eleven technical schools, many of which are of considerable importance. The remuneration of teachers called for strong comment. For university professors the average salary is £628 per annum, but in certain centres the amount is as low as £325. In technical, polytechnic, and similar institutions the average salary (1913-14) was only £165 per annum. Of course in many cases the appointments may be only part time, but, as Sir Robert Hadfield pointed out, the payment is not attractive to the most highly qualified men and women, and hence "it is absolutely essential for the future progress of our Empire that such institutions should be able to offer higher salaries."

The valuable section on patents showed the disadvantages under which inventors have to labour in this country. For a protection of fourteen years "within the Empire and within the region where the Union Jack floats" patent fees would cost about £1340. Against this, in the American Republic protection is afforded for seventeen years throughout the forty-eight States for fees of about £7.

Sir Robert Hadfield put forward a strong plea for the provision of a new building which will house all technical societies, and which "should include a library equipped with the tens of thousands of volumes and papers now constantly required for reference by those interested in technical development." He described the Engineering Societies' Building of New York, with its library of 150,000 volumes, and adjacent Engineers' Club. Mr. Andrew Carnegie made its establishment possible with a donation of £300,000, vested in a Board of Trustees. The need for a chemical club was emphasised also by Prof. W. J. Pope in his Presidential Address to the Chemical Society this year. Welcome as a donation would be from a "Chemical Carnegie" for founding a suitable institution where all chemical and related societies could be housed, surely the time is ripe, with chemical science and industry in their present strong position, and of daily increasing importance, with the President of the Chemical Society as a supporter, and a strong movement already becoming manifest in this Society, for the matter to be energetically taken up. There are doubtless greater "vested interests" to obstruct the way here than in New York, but their positions are surely not unassailable.

ROYAL SOCIETY OF EDINBURGH.

Among the papers read at the meeting held on June 8 (Dr. J. Horne in the chair) was one by Dr. C. Davison on "The Sound-Waves and other Air-Waves of the East London Explosion of January 19, 1917." This was a complete report of the data of observation based upon 725 records from 533 places. There were two sound areas—one around London and the other further north with its centre at the Wash. Between these areas was a region of silence. Generally speaking, the sound heard within the inner sound area was a single report, but in the other sound area there were a great many double reports, triple reports, and even a few quadruple reports. The inaudible air waves were indicated in two ways—by the rattling of windows and the disturbance of pheasants. These collected facts, taken in conjunction with meteorological observations of pressure distribution and wind currents, indicated that the air waves travelled across the region of inaudibility at some height above the ground, and that the sound waves travelled slightly faster than the inaudible waves.

SOCIETY OF PUBLIC ANALYSTS.

The following papers were read at the ordinary meeting held on June 5, Mr. W. T. Burgess, Vice-President, in the chair:—

(1) "A Method for the Colorimetric Estimation of Cobalt," by E. G. Jones.

(2) "Nucleic Acid and its Analytical Examination," by A. Chaston Chapman.

(3) "Opium Wax," by J. N. Rakshit.

(4) "Estimation of Morphine in Opium by Polarimeter," by J. N. Rakshit.

(5) "The Optical Dispersion of Oils and Fats," by P. J. Fryer and F. E. Weston.

(6) "The Valenta and Crismer Tests," by J. H. Johnston and A. W. Stewart.

(7) "A New Method of Identifying Starches," by A. Wynter Blyth.

(8) "Two Plant Products from Colombia, S.A.," By A. L. Bacharach.

(1) The method, which is designed particularly for the analysis of varnishes and zinc paints, is based upon the reaction of cobalt with the sodium salt of α-nitroso-β-naphthol, the effect of several other metals which are likely to be present being eliminated by the addition of ammonium citrate. In the presence of nickel, copper, or large quantities of manganese, preliminary treatment is necessary for the removal of these metals, satisfactory methods for which were described.

(2) The author has worked out a method for the manufacture of plant nucleic acid on a large scale, and at the present time considerable quantities of this acid and its salts are being manufactured for the first time in this country. The more important properties of nucleic acid were described and a number of methods were given for its chemical examination and evaluation.

(3) The paper described the separation of a wax from opium and the isolation of the unsaponifiable matter from the latter. Some analytical constants and properties of each were given.

(4) The author described a process for the polarimetric estimation of morphine after its isolation from opium as the calcium salt. The results obtained were compared with those found by the processes given in the Pharmacopœias of Great Britain and the United States.

(5) The authors have made observations of the refractive indices for the C, D, and F lines of the spectrum on most of the commonly occurring fats and oils, and have calculated the dispersive power corresponding to the formula

$$\frac{(n_F - n_C)}{(n_D - 1)}.$$

They have investigated the effect of free fatty acidity, oxidation and polymerisation on the dispersion figure. The effect of the temperature of the observation has also been considered. The instrument used was the Pulfrich refractometer, with a hydrogen vacuum tube of a pressure of about 2 millimetres. Observations have also been made on the dispersion of selected mineral oils and turpentine.

(6) The difficulty in obtaining comparable figures in the Valenta test when using glacial acetic acid from different sources has led the authors to prefer the use of the Crismer test. Absolute alcohol has been used as the solvent in the test, as it can be obtained commercially of constant strength. The Crismer numbers of various fats were given, and it was shown how the Crismer test, in conjunction with the butyro-refractometer, forms a rapid method of detecting the presence and nature of foreign fat in butters and lards.

(7) The author described a method of identifying starches by taking careful measurements of the individual grains, and from these measurements compiling graphs, each starch having its own particular graph.

(8) The products dealt with were the oil of *Jessenia polycarpa* and the seeds of *Caryodendron orinocense*. Descriptions and analyses of each were given, and, for purposes of comparison, also the recorded figures for olive oil and walnuts. The analytical values of the oil obtained by extracting the crushed seeds with ether were also communicated.

ROYAL INSTITUTION.

"The Romance of Petroleum" was the title of the Friday Evening Discourse delivered by Sir Boverton Redwood on June 7. The interest of the discourse was much enhanced by the fine collection of models which the lecturer displayed.

Having defined petroleum, Sir Boverton Redwood referred to Taylor's oil-gas (1815) obtained from oils, fats, bitumen, or resin, which was delivered in cylinders containing 2 cub. ft., and to the connexion of the Institution with the subject of the lecture through Faraday's investigations in the liquid products obtained in compressing the gas.

Sir Boverton then dealt briefly with the theories of production, and geological conditions favourable to the accumulation of petroleum, mentioning that on the eastern shores of the Caspian and Mediterranean, in Sweden and Sardinia, some conversion of organic matter into petroleum is in progress at the present time. To enable his audience to realise the meaning of the vast output of petroleum (estimated for 1917 as 70,403,128 metric tons, equal to 17 galls. *per capita* of the estimated population of the world) it was stated that a tank 30 ft. high and over 2 miles in diameter would be required to contain it. The area covered by the tank would be about three times that of Hyde Park and Kensington Gardens.

Inasmuch as the British Empire only furnishes 2 per cent. of this output, the lecturer emphasised the value of British control in the Persian oil fields, which, in the face of tempting offers from the Continent, was acquired in 1909 through the powerful co-operation of the Burmah Oil Co. and the late Lord Strathcona. Later, as fresh capital was required, the British Government purchased a controlling interest for £2,200,000. This was carried out during Mr. Winston Churchill's time as First Lord of the Admiralty, and the Admiralty has two representatives on the Board. At the last general meeting the Chairman (Mr. Charles Greenway) stated that if necessary he would find purchasers for the Government holding for not less than six million pounds sterling, and perhaps eight million. Sir Boverton Redwood considered that this acquisition was entitled to rank with Disraeli's purchase of the Suez Canal shares.

Referring to the probability of the occurrence of oil in this country, it was mentioned that at one time oil production appeared in official statistics, the maximum recorded being 200 tons, valued at £488, in 1893. Since 1906 no output has been published. Whilst the geological conditions are consistent with the occurrence of oil, the only conclusive evidence was the test of the drill. Mention was made of the announcement in *The Times* of the same day of the granting of the first licence to drill.

In connexion with drilling for oil, it was stated that this could be carried to depths of over one mile in reasonable time. In one Galician oil-field there are sixteen wells of over 5000 ft., one reaching 5873 ft. As illustrating the enormous output of oil, and the pressure under which it is stored in the strata, particulars were given of a "gusher" in Mexico. The escaping oil took fire and burned for fifty-eight days, with an estimated loss of 3,000,000 barrels of oil. The flames were estimated to reach a height of 1460 ft., with a maximum breadth of about 480 ft.

THE PROFESSION OF CHEMISTRY.

BRITISH ASSOCIATION OF CHEMISTS.

The national meeting of chemists, convened to receive a report on the activities of the Executive of the Association and to discuss the future policy, was duly held in the College of Technology, Manchester, on June 15, Dr. A. Rée presiding. Estimates of the number present varied between 350 and 550, and it was evident that a very strong contingent of chemists from Manchester and district was present. According to the admission cards, about one-third of those attending came under the "A," and about two-thirds under the "B" qualification.

After the financial report, presented by the Hon. Secretary, Mr. T. F. E. Rhead, in the enforced absence of the Hon. Treasurer, Dr. A. Parker, had been adopted, the chairman announced the result of the National Ballot. 1,072 votes had been cast in favour of approving of the proposals of the Institute as reasonably meeting the suggestions of the B.A.C., and 318 against. The voting as to whether the B.A.C. should continue to exist after local sections of the Institute had been formed, resulted in 710 votes being cast in favour of such continuance, and 642 against.

Dr. Rée went on to say that in his opinion the Institute had really met the situation wisely and generously, and he felt that the Council of the Institute could be relied upon to carry out its programme in its entirety. He personally strongly deprecated the continuance of the B.A.C. as contrary to the best interests of the profession, for such a separate body would never by force of circumstances occupy anything but a secondary position to an old established body with solid traditions like the Institute.

The continuance of the B.A.C. would mean a definite cleavage among chemists, and as such would be a source of weakness. He agreed with Prof. Green that "United we stand, divided we fall," and he endorsed these words as strongly as he possibly could. He regarded the formation of Local Sections of the Institute as very important. He felt that if the B.A.C. were continued as a Defence Association, they would have to form a new society for many of the members of the present Society would say quite justly that they were adopting an entirely new object for their Association, differing from those originally contemplated and for which the members had paid their subscriptions.

Many chemists undoubtedly have genuine grievances, but these can be remedied, directly or indirectly, far more effectually by the Institute of Chemistry, rejuvenated and reformed, than by any sort of new society. The Council of the Institute had already instructed its nominations committee to judge henceforth all applications according to the new regulations (this J., 1918, 175 R). If the Association is to resolve itself into a society with the main object of advancing the pecuniary interests of chemists, then nothing could conceivably militate so strongly against improving the status of the chemists, and thereby defeat the very objects the provisional Association had in view. Finally, Dr. Rée made a strong appeal to chemists to trust the Institute to do for them in the future what it had not always done for them in the past, but which in a very short time it would be able to do for the profession better than any other existing body or any new body to be constituted.

At the close of his remarks Dr. Rée read a letter of apology for absence from Sir Herbert Jackson, President of the Institute of Chemistry, in which he stated that—"The Council is desirous of enrolling men of position and established repute whose claims to be recognised as chemists are undoubted,

since it is the clear object of the Council to make the Institute not only the registration authority, but also more completely representative of British chemists as professional men.

"Every effort will be made to bring about the co-operation of all who come within the Regulations now adopted and the Council will spare no pains to secure for the profession of chemistry the position it ought to occupy in all matters which come within its scope."

The following resolutions passed by the Executive were put to the meeting:—

1. That the provisional form of the Society be terminated, and that the Executive be and hereby is instructed to proceed with the definite formation of the British Association of Chemists, and that the following be included in the objects for which the B.A.C. shall be formally established:—

(a) To keep a continuous and critical survey of the developments of the movement for the organisation of chemists.

(b) The co-ordination with a view to federation, if found desirable, of all the organisations concerned with the profession and practice of chemistry.

(c) To devote itself to those interests of chemists which are outside the scope of the Institute of Chemistry's activities.

2. That a meeting of the Association be called in the month of October, and that until that date the Executive shall consist of one representative per 100 members, or fraction of 100 members, from each section (with a minimum of 30 members per section) who shall themselves appoint a chairman, secretary, and treasurer, and that with the exception of the chairman in the exercise of his casting vote, these officers of the Executive shall have no vote in their official capacity.

3. That the Executive in consultation with the Sections shall prepare a scheme of definite organisation and objects to be placed before the meeting in October, and that full particulars of these proposals shall be in the hands of members at least one month before that meeting.

4. That a register of members be prepared on the basis of the "A" and "B" qualifications, these qualifications to be those of the Institute or their equivalent in the opinion of the B.A.C. Executive.

Resolutions 1, 2 and 3 were carried by large majorities, and the following amendment to No. 4 was also carried by a large majority:—

"That a register of members be prepared on the basis of the B.A.C. accepted qualifications."

In proposing Resolution 1, Professor Hinchley (London) said it was essential that chemists should organise in order that they might have a voice in the deliberations of the Industrial Councils as outlined in the Whitley report. They could not expect the Institute of Chemistry to deal with this matter, nor with remuneration, employment and friendly society work. Through its local sections it could do more than any other chemistry institution in the country by looking after the legal interests of its members in the advancement of the profession and the vigorous prosecution of education. The training of young chemists from laboratory boys could be successfully supervised. He especially emphasised that every local section of the B.A.C. should be a friendly society for mutual help.

Mr. Harry Thompson (Hull) seconded the resolution, and remarked that the B.A.C. being entirely British would be able to deal with the problem of the influx of cheap alien chemical labour which he anticipated will be resumed after the war.

Mr. Hannay (Manchester) strongly supported the resolution. He said many of them had been greatly upset by the policy of the Executive. Those older men who were not qualified to take the A.I.C. examination, and who were to be left outside, were men who carried out a large amount of the chemical work of the country.

The resolution was carried by a large majority.

Resolution 2, proposed by Mr. Harrison (Leeds), and seconded by Mr. Weil, was also carried by a large majority.

Prof. Hinchley proposed Resolution 3, and Mr. McCulloch seconded. Messrs. Hickson (Leeds) and Kay (Manchester) supported, the latter suggesting that the words "in consultation with, etc.," should be interpreted "in full consultation with, etc." It was carried by a large majority.

Mr. F. W. Smith (Birmingham) then proposed Resolution 4, and Dr. Dunn (Newcastle) seconded. Mr. Smith explained that the Executive had found great difficulty in co-ordinating ideas on qualifications, and he knew of no better nominations committee than that of the Institute of Chemistry. He believed the Institute would carry out the B.A.C. interpretation of qualification "B," but the resolution included such "B" men who would conceivably not get into the Institute, but who the B.A.C. Executive believed ought to be reasonably included in a Defence Association. He thought there was no cause for complaint, although works chemists whose qualifications do not come up to the "B" qualification were apparently dissatisfied. He felt that if the matter were considered from the points of view of the profession and the "bottom dog," they would agree that it would not be right to put the B.A.C. into the hands of the unqualified man.

Mr. Schofield in a vigorous speech condemned the resolution as contrary to the interests of the B.A.C. He proposed as an amendment: "That a register of members be prepared on the basis of the B.A.C. accepted qualifications." He said they all recognise not merely the desirability and necessity of working together as far as possible, but that they must make the fullest use of the Institute's concessions regarding the A.I.C., and they must not do anything detrimental to the Institute. They dare not leave out of the B.A.C. a great many works chemists whom the Institute could not accept, but who were often far better than academically qualified men, on their particular work.

Mr. Garland seconded the amendment, saying he could not understand Mr. Smith's resolution. He said that at the commencement the British Medical Association took in everyone practising medicine, and the B.A.C. wanted the same.

Mr. T. F. E. Rhead contradicted this statement, saying the British Medical Association from the beginning included only qualified men.

Mr. Gabriel-Jones moved a further amendment, which was duly seconded:—"That a register of members be prepared composed entirely of chemists registered by the competent registration authority, that is the Institute of Chemistry."

A further amendment was proposed by Mr. Dufty and seconded by Mr. Payman "That the definitions of the qualifications 'A' and 'B' be referred back to the Executive."

Mr. W. E. Kay explained that it was more a "list" that was required, not a "register."

Mr. Hannay interpreted qualification "B" rather lower than that of the Institute, and desired to include such men to begin with, but to make the qualifications more stringent afterwards.

Professor Hinchley said they wanted to include all chemists in responsible positions.

Mr. E. L. Rhead and Mr. Stones, in supporting Mr. Smith's resolution, emphasised the need for restricting the Association to men who possessed the qualifications "A" and "B" as a minimum.

Dr. Forster strongly supported Mr. Schofield's amendment, saying the word "chemist" was not

yet really defined. The Association interpreted "A" and "B" rather differently to the Institute.

Mr. Rowell also supported Mr. Schofield's amendment. Mr. Tyler spoke in favour of Mr. Smith's resolution, saying that by pushing the local sections of the Institute of Chemistry chemists would get all they wanted.

On being put to the vote Mr. Schofield's amendment was passed by a large majority.

Prof. Hinchley proposed a hearty vote of thanks to Dr. Rée, which was seconded by Dr. Hedley, and carried with enthusiasm.

In acknowledging the vote, Dr. Rée announced that as he was entirely out of sympathy with the resolution to continue the existence of the Association, he would resign forthwith. From the very outset he had held, and had stated publicly, that the objects sought by the provisional Association could be best carried out by the Institute, and that if the latter would meet their wishes there would be no need for a permanent association. These objects had now been attained, and therefore the continued existence of the B.A.C. was both unnecessary and inadvisable.

Hearty votes of thanks were also accorded to Messrs. Parker, Crowther and Rhead for the work they had done as officers of the Executive.

Mr. Rhead stated he wished to resign the General Secretaryship owing to the large amount of time it absorbed, but he would carry on until a new secretary was appointed.

Students of Chemistry and Military Service.—The Registrar of the Institute of Chemistry has received a letter from the Board of Education stating that the Ministry of National Service has cancelled the arrangements made in connexion with military service of students of chemistry. The effect of this cancellation is that any student of chemistry in Category B (i), C (i), or B (ii), or in Grade 2 who has hitherto been protected under the arrangements in question, will be called up, if otherwise available for service.

Corrigendum.—In the report of the meeting of the Liverpool Section of the B.A.C. in the last issue (page 222 R, l. 1) instead of "central" read "*competent.*"

PERSONALIA.

The following promotions in, and appointments to, the Most Excellent Order of the British Empire have been notified :—

Knight Commander (K.B.E.) : Col. Sir F. Nathan.

Commanders (C.B.E.) : Sir H. E. Boulton, Bart., Prof. H. B. Dixon.

Officers (O.B.E.) : Prof. P. G. H. Boswell, Dr. A. C. Cumming, Capt. F. A. Freeth, Major L. B. Holliday, Dr. J. C. Phillip, W. Rintoul, Esq., Dr. S. Smiles, H. J. S. Stobart, Esq., Miss M. A. Whitely.

Members (M.B.E.) : H. H. Barker, Esq., F. P. Burt, Esq., C. E. Eastick, Esq., E. V. Evans, Esq., F. H. Glew, Esq., J. I. O. Masson, Esq., J. D. McB. Ross, Esq., A. W. Tangye, Esq., Dr. E. C. B. Wilbraham.

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Sir R. T. Glazebrook has been awarded the Albert Medal of the Royal Society of Arts for services rendered in connexion with the National Physical Laboratory and the Advisory Committee for Aeronautics.

NEWS AND NOTES.

AUSTRALIA.

Eucalyptus Oil Production.—The eucalyptus oil industry is now of considerable importance in New South Wales. The oils are used mainly for three purposes :—In pharmacy, in the separation of metallic sulphides, and for perfumery and flavouring. Experts consider that some indigenous eucalyptus species will play an increasingly important part in the supply of certain constituents used in the perfumery industry as well as for flavouring purposes. *Eucalyptus macarthuri* grows very rapidly, and is being cultivated freely. The leaf oil consists mainly of geraniol together with geranyl acetate, of which not less than 60 per cent. is present in the crude oil. *E. citriodora* yields about 0·75 per cent. of an oil consisting almost entirely of the aldehyde citronellal. *E. staigeriana* gives a high yield of citral-bearing oil, which after rectification is an excellent substitute for lemon oil and very much cheaper. The principal terpene in this oil is lævo-rotatory limonene. There are about 300 species of eucalyptus in Australia, but of these not more than 25 varieties can be utilised for their oil. Up to the present the oil products of about 160 eucalypts have been determined. The value of eucalyptus oil exported from Australia to the United States in 1917 was £4829 and to Canada £1224; the corresponding values for 1916 were £2434 and £180.—(*Perf. and Essent. Oil. Rec., April* 23, 1918.)

NEW ZEALAND.

Report of Industries Committee.—The Select Committee appointed by the House of Representatives has recommended that increased facilities, in the form of reduced railway rates, protection through the Customs, etc., shall be granted to the local tar-distilling industry, and that Government Departments shall give a decided preference to goods manufactured in the Dominion from tar and its by-products, provided the price and quality are satisfactory. With regard to the utilisation of steel scrap and waste by electrical process, the Committee recommends the remission of Customs duty on machinery imported for the erection of the electric furnace necessary for the production of steel by this process, and that further inquiry into the question of the production of iron and steel in the Dominion should be pursued.—(*Bd. of Trade J., June* 13, 1918.)

CANADA.

Pig Iron and Steel Production in Canada.—The total production of pig iron in Canada in 1917 amounted to 1,171,789 short tons, of which 1,156,789 tons was produced in blast furnaces and the remainder (returns for which are incomplete) in electric furnaces. The latter variety consisted of a high grade, low phosphoric iron produced from shell turning and other steel scrap. Ferro alloys showed a big increase, 40,329 tons being produced as against 28,628 tons in 1916. They consisted chiefly of spiegel-eisen, ferro-molybdenum, and ferro-phosphorus, the latter two being produced in electric furnaces.

Steel production amounted to 1,736,514 tons (including 46,344 tons of direct castings), an increase of over 18 per cent. The total production of electric steel was about 50,000 tons, as against 19,639 tons in 1916 and 5625 tons in 1915.—(*U.S. Com. Rep., April* 5, 1918.)

UNITED STATES.

American Research in Applied Chemistry.—In an address lately made by Dr. Charles L. Reese, chemical director of E. I. du Pont de Nemours Co., of Wilmington, Delaware (and elsewhere), he stated that that establishment

would spend over $2,000,000 in research alone during the current year and that they employed 866 chemists.

The Dust Problem in Factories.—Dr. H. F. Smith reports in the "Scientific Monthly" the results of dust tests carried on by the University of Pennsylvania Hospital staff in various industries. The weight of dust inhaled per day varied from 0·4549 gm. in a Portland cement factory to 0·0081 gm. in a silk weaving factory. Dust may be prevented by the substitution of wet for dry processes, by frequent vacuum cleaning and by increasing the relative humidity; but the details for carrying out the improvement in a cement mill are not very clear.

A New Artificial Milk.—An important development in the art of making artificial milk and cream has lately been completed in the laboratory of Messrs. Arthur D. Little, Inc., of Cambridge, Mass. Dried skim milk and coconut oil are mixed with water and emulsified. To this a stabiliser is added which serves as a colloidal protector for the oil and maintains an emulsified condition.

A New Sewage Process.—A patented process for the treatment of sewage, invented by G. H. Miles, consists in introducing sulphur dioxide into the sewage before it reaches the settling tanks, where, after a period of four hours, an adequate sedimentation is said to take place. The acid splits all the soaps, changes the nature of the sludge, and the effluent is effectively sterilised. The sludge is evaporated to dryness, and then degreased. As far as can be ascertained, this has not yet been done on a large scale, but the problem should not be insurmountable. After degreasing the sludge has no evil odour, and will keep for a very long time. Complete tests have not been made, but Prof. Winslow, of New Haven, Conn., finds the results promising. The degreased sludge should fetch a good price as a low-grade nitrogenous fertiliser.

GENERAL.

Possible Raw Materials for Paper-making.—In his lecture on "Substitution of Raw Materials" at University College, W.C., on May 27, Professor F. W. Oliver dealt with the manufacture and supply of paper, and the need of finding new sources of raw materials. The falling off of about 80 per cent. in imported mechanical pulp must be counteracted by using less paper, by better organisation of the available raw materials, and by discovering new home sources. The utilisation of new fibres is impeded by the shortage of labour, by the want of adaptability of factory plants, and by the reluctance of makers to change the nature and quality of their output. The poor quality of paper now everywhere apparent depends on various causes, one of which is the use of straw in the place of esparto.

The lecturer has been investigating the possibility of utilising a species of *Spartina*, a luxuriant grass which flourishes in Southampton Water and in Poole Harbour. The plant, which made its first appearance at Southampton in 1870, has spread very rapidly in the last twenty years, and now covers an area estimated at about 15—20 square miles. The amount of fibre it would yield would give about 13,000 tons of dried grass and, say, 4000—5000 tons of paper per annum. The chief difficulty is to find a suitable means of harvesting, and another is that the plant is not easily dried. The paper produced from it has been highly spoken of by a leading technologist; but it has several defects, among which contamination with mud and poor bleaching property were the chief. Couch grass is another potential source of fibre, but the obstacles here are the presence of dirt, and very great cost of collection.

Marram grass (*Psamma*), which grows on sand dunes, is well suited for paper manufacture, but before it could be of value commercially some means of effecting close planting would have to be adopted. Large areas suitable for this purpose could be found in Cornwall and Scotland. Messrs. Clayton, Beadle and Stevens, reporting on a laboratory test of this grass in the Kew Bulletin, 1912, p. 363, stated that the yield of unbleached fibre was 31·4 per cent. on the dry weight; that the fibres possess good felting qualities; and that, although the fibres are shorter than those of esparto, the Marram-paper possessed greater strength and promised to be suitable for fine printings. Recent small trials had confirmed the view that Marram-grass was deserving of serious consideration, and it was hoped that a trial on a commercial scale might be possible in the near future.

Soy Bean Milk.—It is well known that many thousands of tons of soy beans have been imported into this country for the sake of the contained oil, which is used in the manufacture of soap, margarine, etc. More important, perhaps, from the alimentary point of view is the fact that it can be used to yield a substitute for cow's milk, which closely resembles the latter both in composition and properties. The method of preparation is very simple :—Five ounces of the beans are soaked overnight in a quart of cold water; they are then coarsely ground, mixed with the water in which they have been soaking, and filtered through muslin. The result is a milky fluid with a rather strong smell of haricot bean, which disappears after it has been raised to boiling point. It closely resembles milk, contains 3·13 per cent. casein and 9·89 per cent. fats, but lacks carbohydrates. Cheese can be prepared from it, 120 gms. of the bean yielding 184 gms. of cheese. The residue after making milk can be worked up into diabetic biscuits.—(*Brit. Med. J., April* 13, 1918.)

Phosphatic Fertilisers in British India.—The following resolutions have been passed by the Board of Agriculture in India, as the result of the report of the Committee appointed to consider the value of local phosphatic manures.

1.—That with a view to encouraging the extended use of phosphatic manures, the Board considers that a survey of the resources of the country in mineral phosphates should be undertaken by Government. In view of the vital importance to Indian agriculture of keeping the supply of phosphates at a price within the reach of the cultivator, the Board suggests that control over all the internal mineral sources of supply should be retained by Government.

2.—That in view of the great distance over which manures must be carried in India from the centres of supply to the fields of cultivators, the Board is of opinion that the question of reducing internal railway rates charged on such concentrated manures should be considered by the Railway Board.—(*Bd. of Trade J., June* 6, 1918.)

Improvements in Indian Jute Cultivation.—The jute crop in Bengal affords a good illustration of what science and practice working in union can achieve. A few years ago Mr. Finlow, the fibre expert, evolved a pure line of jute to which he gave the name Kakyai Bombai No. 7. In comparison with other varieties of *capsularis* jute it gives an increased yield of 3 maunds per acre, and if it were universally adopted in the *capsularis* growing tracts the increased value of the output would be £3,000,000 per annum—"a sum which would support the whole Indian Agricultural Service for years, and in doing so would enrich the people of India by something like thirty times that amount." The merits of this variety have been well advertised, both by the Department and by the district authorities, with the result that 30,000 packets of seed, representing a sown area of as

many acres, have already been distributed for this season's crops. Experiments to determine the relative values of the Kakyai Bombai and local species have demonstrated the marked superiority of the former. Further great improvements are possible by the use of fertilisers. That there is a great future for chemical manures in jute cultivation appears certain. On acid red soils, for instance, the application of lime has been proved to increase the yield by nearly 6 maunds of fibre per acre, equivalent to an additional profit of Rs 29 per acre, after the payment of the cost of manure. The use of potash on the laterite soils of Eastern Bengal has given striking results, and there appears to be little doubt that the way to larger yields lies in the regular reinforcement of the potash constituents of the soil. There is also reason to believe that the same treatment provides a very effective palliative, if not remedy, of the wilt disease known as *rhizoctonia*, a soil fungus which attacks the roots of jute and other plants. Experiments conducted by Mr. Finlow showed that diseased plants were ten times as numerous in plots not treated with potash as in those treated, and though the tests have not continued long enough for absolutely definite conclusions to be drawn, there is a very strong probability that the disease is due to mal-nutrition of the plant.—(*Pioneer Mail, Mar.* 3, 1918.)

Oil-seed Production in Indo-China.—According to M. Brenier, Director of the Chamber of Commerce at Marseilles, the resources in oil seeds of Indo-China are of the greatest importance. The chief oil-bearing plants under cultivation are the cotton plant, soy bean, castor-oil plant, sesame, pea nut, and coconut. The oil yield of the Cambogia soy bean is superior to that of the Manchurian, although it does not exceed 18 per cent. The castor-oil plant of Tonkin has been found to yield 42 per cent. of oil in laboratory experiments, but only about 35 per cent. in actual practice. Sesame cultivated in Annam and Tonkin gives as much as 50 per cent. of oil. The yield per acre is $9\frac{1}{4}$ cwts., as compared with $4—4\frac{1}{2}$ cwts. in British India. Formerly Marseilles imported up to 420,000 tons of ground (pea) nuts annually, one-half of which came from Senegal, where a yield of 20—29 cwts. per acre was obtained. The light soils of Tonkin, Central Annam, Cochin-china, and Cambogia are more favourable, and yields up to 49 cwts. per acre have been obtained. An easily harvested type of pea-nut has been introduced from China, but the oil yield is not so high. The coconut palm covers nearly 25,000 acres. It is grown chiefly along the Annam coast. The coast of the Gulf of Siam, which is outside the typhoon zone, is the most favourable district for this cultivation.—(*Ch. of Comm. J., May*, 1918.)

Water Power in Norway.—The enormous water power of Norway has so far only been utilised to a small extent for power and lighting purposes, but the shortage of coal and the increase in its price to ten times the pre-war figure have made it essential that the water power be fully utilised. About 15,000,000 horse power will be available, and it is intended to centralise this for transmission. The work is to be commenced at once and will cause a big demand for electric cables and wire.—(*U.S. Com. Rep., April* 5, 1918.)

The Japanese Camphor Industry.—The subjoined report has been received from H.M. Embassy at Tokio.

As the weather in Formosa in 1917 was very unfavourable, and as the work of producing camphor was unremunerative in comparison with other forms of employment, such as charcoal burning, the actual production of camphor in that year fell far below the estimated output. The output of camphor in Formosa in the twelve months ended March 31, 1918, was about 60,000 piculs (picul = $133\frac{1}{3}$ lb.), as compared with 89,300 piculs in 1916-17, while in Japan Proper the respective totals were 20,000 piculs and 39,600 piculs. The combined figures for Formosa and Japan Proper were, therefore, about 80,000 piculs in 1917-18 and 128,900 piculs in 1916-17. The following table shows the export of crude camphor from Formosa during 1916 and 1917, and also of refined camphor from Japan in these two years:—

	Refined Camphor from Japan.		Crude Camphor from Formosa.	
	1916	1917	1916	1917
To	kin	kin	kin	kin
United Kingdom ...	639,125	145,130	838,500	761,800
British India	1,416,041	1,082,490	—	—
Australia	92,605	112,400	—	—
France	379,862	66,618	270,200	76,500
United States	2,654,438	1,493,135	4,680,750	4,065,600
Japan	—	—	2,002,045	1,252,272
Asiatic Russia	447,068	65,146	75,000	—
China	—	—	14	89
Other Countries ...	124,713	154,696	—	—
Total	5,753,862	3,119,915	7,866,509	6,156,261

Kin = 1·32 lb.

It appears that the Formosan Camphor Refining Company, which began its operations in November, 1917, will consume 10,000 piculs a year, while the new amalgamation of camphor refiners in Kobe, known as the Nippon Camphor Refining Company, which was formed on February 5 last, will consume 50,000 piculs a year. Over and above this, it is understood that 12,000 piculs a year is to be allotted to the celluloid manufacturers in Japan Proper, so that the total consumption of raw camphor in Japan will in future be 72,000 piculs a year. If the production remains at 80,000 piculs a year there will be only 8,000 piculs available for export. On the other hand, it must be remembered that in 1916 the actual production was 128,900 piculs, so that the margin available for export would be appreciably larger in years when the output of camphor is good.

According to present indications, however, there is but little prospect of the output of camphor being increased in the near future. It may, indeed, be reduced. The hopes which were entertained some years ago of obtaining camphor from the leaves of the camphor tree have not materialised, and the quantity of camphor procured from the young trees has not been satisfactory. The roots of the old trees have been dug up and used, and all possible accessible sources have been tapped. To work the distant forests is still both difficult and dangerous on account of the unsubdued savages, and the profits to be obtained are not commensurate with the risk.—(*Bd. of Trade J., June* 6, 1918.)

Iron and Steel in China.—The possibilities of cheap iron and steel from China are well worth careful consideration. A comparison of the costs of producing a ton of pig iron in the U.S.A. and at the Manchurian works at Penchihu is very greatly in favour of the latter, owing to much cheaper, if less efficient, labour. In comparing the relative efficiency of American and Chinese workmen, it is not strictly correct to say that the production of 100 men of 50 per cent. efficiency is equal to the production of 50 men of 100 per cent. efficiency, for the quantity of the output may be the same, but the quality may be very different. This applies particularly to highly skilled work, but probably need not be taken into account in the production of pig iron. Before the war the freight on pig iron to the Pacific coast was about \$3 (gold), and the Chinese iron could be landed at Pittsburg *viâ* the Panama Canal cheaper than the blast furnaces at Pittsburg could make it. The same may be said of steel; for the gas from the coke ovens at Penchihu can be used to convert the pig iron into

steel, while the poorer gas from the blast-furnaces operates the coal mining and other machinery.—(*Far Eastern Rev., Jan.*, 1918.)

THE MANGANESE DEPOSITS OF EASTERN CUBA.—Several hundred manganese mining claims have been lodged in this province during the past year, but very few offer the possibility of profitable working owing to difficulties of transport and poorness of grade. The introduction of motor trucks and tractors is making transport easier, but practically none of the ore comes up to the standard of 48 per cent. metallic manganese. Of the various groups of mines, the Ponupo group produces 5000 tons of ore monthly, averaging from 38—40 per cent. metallic manganese and low in silica and iron; the Cristo group produces 4000 tons monthly of about the same grade, but the greater portion of the ore requires washing; the Palmanto and the Los Negros each produce about 1000 tons monthly of high-grade ore. The total production is about 12,000 tons monthly, all of which is at present exported to the United States.—(*U.S. Com. Rep., Mar.* 26, 1918.)

THE USE OF PEAT AND WOOD FOR GAS MAKING.—At the end of 1917 the Italian Fuel Controller issued an Order to the effect that the use of coal for gas making was to be prohibited, and works were to be allowed to use only wood, lignite, peat, and the like. The Order has been severely criticised on the ground of its extravagance by Pacchioni and Böhm, two Italian members of the Société Technique du Gaz. They point out that the acid nature of the liquors produced by the distillation of materials of a woody nature results in corrosion of plant which is designed for dealing with alkaline liquors. The yield of gas is small and its quality very poor. The temperature at which it is necessary to distil in order to obtain an adequate yield of gas is destructive to the very substances which in the ordinary way are profitably recovered in the distillation of wood. The residual coke or charcoal is of a light, porous nature and of doubtful value. It is suggested that these drawbacks could be avoided by distilling mixtures of these substances with at least 35—40 per cent. coal. The importance is urged of the rational utilisation of fuels by distillation instead of burning directly in furnaces of primitive type. They conclude that there is good ground for the declaration that, failing a supply of coal in the minimum proportion of 35—40 per cent., it would be in the national interest to suspend the operation of the gasworks. (Compare Baly, J.S.C.I., **35**, 1240, where it is pointed out that peat may be used successfully in producer gas plants.)—(*Gas Journal*, May 21, 1918.)

PULVERISED FUEL.—A report recently made by the Fuel and Fuel Handling Committee of the Naval Consulting Board to the President of the United States Shipping Board, on the use of powdered fuel, states that 50,000,000 tons of coal have been pulverised and consumed as powder within recent years in the United States. The method is extensively employed for smelting, burning Portland cement, and, to a limited extent, for raising steam, and definite economies have been claimed over the use of solid fuel. They recommend its adoption for marine purposes. Pulverised coal under ordinary conditions is a smokeless fuel, but by a simple adjustment of the burners dense clouds of smoke can be obtained to serve as a screen for the vessel. In an emergency the ship's boilers may be forced, thereby increasing steam supply and the speed of the vessel. The Committee consider that it is not feasible to carry powdered coal on merchant or naval vessels used in Transatlantic service, but recommend the installation of pulverising plant on board these vessels. Suitable installations are now being tested at the Annapolis Experimental Station. (*Iron and Coal Tr. Rev., May* 24, 1918.)

URUGUAYAN EXPERIMENTS WITH BITUMINOUS SCHIST. Dr. Graham Clark, a director of the Chemical Institute at Melo, has just completed a number of experiments on bituminous schist, which is found in great quantities in the Department of Cerro Largo. 9500 calories per cubic metre were found, as against 10,000 from fuel oil. The oil from the schist has been tried with good results in semi-Diesel engines.—(*U.S. Com. Rep., April* 3, 1918.)

HONG-KONG SUGAR FOR EUROPE.—Hong-Kong is a collecting station for sugar produced over a wide area. Thus in 1917 it imported 196,000 tons of sugar from Java, 80,000 tons from the Philippine Islands, 11,000 tons from the Lower Asiatic Coast, and 30,000 tons from Formosa. A considerable export trade to Europe is developing, being limited only by the shipping available. The total sugar export averages about 297,000 tons per year, the figures for the last six months showing 139,637 tons of refined sugar, 2548 tons of raw sugar, and 6317 tons of sugar candy. One of the large refineries has been shipping 10,000 short tons per month of refined sugar to India and Europe. The unrest in China, and the difficulties of shipping, prevent any large development taking place in this industry.—(*U.S. Com. Rep., April* 3, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

In moving the second reading of the Coinage (Decimal System) Bill, Lord Southwark said that it had met with very general approval by banking, commercial, professional, and scientific organisations. Every country in the world except the British Empire employed some form of decimal coinage, and now was the time to make preparations for introducing it after the war. Lord Leverhulme opposed the Bill on the ground that the proposed subdivision of the sovereign into 1000 mils would be extremely inconvenient and that the British halfpenny should be taken as the unit for a decimal system. Lord Hylton speaking for the Government, admitted that the desire for change had been steadily growing, but maintained that the advantages of a decimal system had been exaggerated. The Government would not support the Bill, but if desired it would appoint a Joint Committee of the two Houses to deal with the question. After a somewhat lengthy discussion the debate was adjourned *sine die*. (June 4.)

HOUSE OF COMMONS.

"Dirty" Coal.

The President of the Board of Trade, replying to General Croft, said that the Controller of Coal Mines is fully alive to the significance of the increasing percentage of separable dirt in coal, and is sparing no effort to decrease it. The importance of the matter has been impressed both upon the miners and the colliery managers, and an officer of special experience was making investigations at collieries with regard to specific complaints. The increasing percentage of separable dirt is largely due to the shortage of labour and machinery. He was not prepared to accept the statement that 5,000,000 tons of coal were wasted owing to the presence of unnecessary dirt.—(June 10.)

Sewage Treatment.

In answer to General Croft, the President of the Local Government Board (Mr. Hayes Fisher) said that the principal steps taken in the matter of treating the sewage of great cities with a view to providing fertilisers were in the nature of research work. Great practical difficulties, such as the procuring of necessary labour and plant, drying and handling the sludge, and transport, stood in the

way. Moreover, the manurial value of sewage sludge is not very great.

In a written answer to the same member, Mr. Hayes Fisher said that in the opinion of the responsible advisers of the London County Council no practicable and economical scheme for utilising the sludge of London sewage as a fertiliser has yet been evolved. The yearly output of sludge sent from Barking and Crossness and discharged into the sea averages about 2½ million tons, of which over 90 per cent. is water.—(June 17.)

Cultivation of Sugar-beet.

The President of the Board of Agriculture informed General Croft that plans for the sugar-beet factory to be erected on the Kelham Estate, Notts, are being obtained. The Estate Committee of Management appointed by the Board has arranged for the sowing of sufficient seed this year to be transplanted in 1919 for the production of seed that would sow 5000 acres of beet in 1920. The Board has been unable to recommend the erection of the factory and of the necessary machinery during the war. The factory in Norfolk is closed, mainly owing to the difficulty of getting seed from Holland.—(June 17.)

Salvarsan Substitutes.

Mr Hayes Fisher, replying to Mr. Snowden, intimated that arrangements had been made for the manufacture of kharsivan, neokharsivan, arsenobillon, novarsenobillon, diarsenal, and galyl. These preparations are manufactured under the conditions contained in the licences issued by the Board of Trade, and are tested by the Medical Research Committee before sale; they are supplied free of charge to registered medical practitioners who possess the necessary special qualifications. The responsibility for the use of these preparations in any particular case rests with the practitioner in attendance.—(June 17.)

Soap Industry.

Replying to Mr. Sherwell, Mr. Clynes stated that every possible precaution will be taken to safeguard the interests of the smaller manufacturers in any scheme which may be put forward for the control of the soap-making industry.—(June 17.)

British Dye-making Industry.

Mr. Wardle, for the Board of Trade, answered a question put by Mr. Sherwell as to whether the proposed Government assistance to Messrs. Levinstein and British Dyes, Ltd., is to be extended on the same terms to other producers of dyes who may hereafter apply, by referring to the statement of the President of the Board of Trade on May 15, which specifically laid down that the proposed amalgamation will have no monopoly; also all dye manufacturers will have the same encouragement for research.—(June 18.)

Cotton Crops.

In a written answer to Sir R. Cooper, Mr. Hewins gave the following statistics concerning the exports of cotton from the Colonies during 1917:—

	cwt.		cwt.
Barbados ...	531	Leeward Islands:—	
Bahamas ...	35	Antigua ...	299
Trinidad	2	St. Kitts ...	687
St. Vincent ...	2,732	Nevis	1,556
Nyasaland ...	9,720	Anquilla ...	441
East Africa Protectorate ...	430	Montserrat ...	2,731
		Uganda	104,741

The provisional estimate of the Indian cotton crop for the financial year 1917-18 is 4,036,000 bales.—(June 18.)

LEGAL INTELLIGENCE.

Heliotropine Contract. *C. Lueders and Co. v. Cooke, Tweedale and Lindsay.*

An appeal by Messrs. Cooke, Tweedale and Lindsay, Ltd., manufacturing agents, of Manchester, from a judgment of Mr. Justice Bailhache in an action against them by Messrs. Geo. Lueders and Co., importers, of New York, for damages for non-delivery of 25 cwt. of heliotropine, was dismissed by the Master of the Rolls and Lords Justices Scrutton and Duke, in the Court of Appeal on June 4.

The Master of the Rolls said that it was not disputed that the contracts for the sale of the heliotropine were made, nor that there had been a breach of them, in the sense that none of the heliotropine had been shipped. In the mistaken belief that a licence to export was necessary, the defendants applied to the War Trade Department for such a licence, and the application was not acceded to. There was no foundation for the inference of Mr. Justice Bailhache that the application for a licence to export was not made *bonâ fide*.

The defendants, however, relied on section 3 of the Courts Emergency Powers Act, 1917, which gave to a contracting party relief from liability when the fulfilment of a contract was interfered with by a Government Department in the national interest in connexion with the present war. No certificate was produced from the War Trade Department saying that they had given the defendants "directions or advice" with the object of preventing the fulfilment of the contract in the national interest in connexion with the present war, although apparently the defendants had applied for such a certificate. Nor had the defendants proved that when they received the form saying their application for a licence had not been acceded to they interpreted that as meaning that a licence was necessary. A licence to export was not, in fact necessary, and if the goods had been sent forward they would have been passed by the customs as other similar consignments were passed from time to time. Therefore the defendants had not brought themselves within the protection afforded by the section, and the appeal failed.

Lords Justices Scrutton and Duke concurred, and the appeal was dismissed with costs.

Contract for the Sale of Sulphur. *The North British Chemical Co., Ltd. v. Victors, Ltd.*

Sitting in the Commercial Court on June 4, Mr. Justice Sankey had before him the above case, which was stated as a special case by the arbitrator, Mr. A. J. Ashton.

The claimant company, of Deansgate, Manchester, sought damages from Messrs. Victors, of Hartshead, Stalybridge, on the ground that the latter had refused to fulfil a contract for the sale of 250 tons of sulphur at £6 17*s*. 6*d*. per ton. Messrs. Victors, Ltd., had claimed an extra 2*s*. 6*d*. per ton, because, according to the contract, the firm was entitled to charge that sum for delivery *ex* ship, Liverpool, instead of delivery at Garston. The North British Company had refused to pay this, and in consequence the respondent company, it was claimed, cancelled the contract by the exercise of an option to do so in the event of a breach of the condition of prompt payment.

The dispute resolved itself into the question as to whether Messrs. Victors had in fact exercised this option or not. The arbitrator had found that (if he were entitled to look into all the circumstances) Messrs. Victors had never intended to exercise it, and that the claimant company was entitled to £350 for breach of the agreement. His Lordship upheld the award of the arbitrator, and gave judgment accordingly, with costs.

CLAIM FOR SERVICE OF FIRE BRIGADE. *Grays Thorrock Urban District Council* v. *Grays Chemical Works, Ltd.*

In the King's Bench Division on June 6, before Mr. Justice Sankey, a matter of interest to chemical manufacturers arose in a case in which the Grays Thorrock Urban Council claimed a sum of £81 9*s.* 6*d.* from the Grays Chemical Works, Ltd., of Grays, for services rendered by the Grays Fire Brigade at the defendant's works.

Mr. A. E. Woodgate represented the Council, and Mr. G. A. Scott the defendant company.

Mr. Woodgate said the action was one to recover an amount due for services rendered to the defendant, by and at its request, by the plaintiff's fire brigade, and the question was whether these services were rendered in such circumstances as to impose an obligation on the defendants to pay for them, or whether the cost should fall upon the ratepayers of the district.

In the early morning of February 5, 1917, the roof of a large shed at the defendants' works fell in. In this shed a large quantity of chemicals was stored, and it was feared that an explosion or fire might ensue. The fire brigade was sent for, and when it arrived the captain received and acted upon the instructions of the defendants' works manager. A fire had not broken out, but water was applied to the débris as a precautionary measure. In the afternoon the captain of the fire brigade came to the conclusion that there was no reason why the brigade should remain there any longer, but the manager desired that two men should be left on the works. At the captain's suggestion, however, four men were left, and these remained until February 10, when they were removed at the defendants' request. He did not contend that if the fire brigade had rendered these services under ordinary circumstances the Council could sustain this claim, but his contention was that the local authority was asked to render these services, and payment was asked for on the ground that it was requested specially to render them.

Mr. S. L. Ellborne, Government Chemical Inspector, stated that he was at the works about 10.30 on the morning of February 5, and found that the roof of a shed 200 ft. by 80 ft. had partly collapsed. Under the débris there was a number of carboys of chemicals, some of which had been smashed, and there was considerable risk of a fire owing to the presence of the acids amongst the wood. There was a risk of spontaneous fire and explosion which would have spread to other parts of the building, and might have led to a serious disaster. In his opinion it was necessary for public safety that water should be poured upon the débris.

Mr. Scott said the case was narrowed down to whether or not there was a service rendered under Section 32 of the Police Clauses Act (which had been cited). He submitted that there was. Although it was true that no conflagration took place, it was obvious that if the defendant company had not called the fire brigade and had the chemicals drenched with water, it would have taken upon itself a very grave responsibility. He said the service rendered was for the public good, and the public safety, and the charge should, therefore, fall upon the rates.

In giving judgment on June 20, his Lordship said that the defendant was entitled to summon the fire brigade on the first day and to have the benefit of its service without payment. There was no right to wait and see, and so expose the premises to serious risk of fire or explosion. If there had been no reasonable expectation of fire the common law would have been applicable, and the defendant would have been liable to pay. The defendant had no right to have retained the brigade after the first day, as its services were not needed. Therefore it was not entitled to throw the charge for these extra services on the ratepayers. The point raised by the Defence that the case came under the Public Health Act, and could therefore only be dealt with by the magistrates, failed.

The Council was entitled to £55 for the services of the fire brigade after the first day, and also to costs on "C" scale.

APPLICATIONS AT THE PATENTS COURT FOR LICENCES TO USE ENEMY PATENTS.

British Dyes, Ltd. On June 5, before the Comptroller of Patents, Mr. H. Temple Franks, an application was made by British Dyes, Ltd., of Huddersfield, for licences to use a large number of German chemical patents in the name of the Farben-fabriken vormals Friedrich Bayer & Co., for the manufacture of dyes and intermediate products. The application related to the following patents:—

23072/1904, 14248/1907, 5484/1908, 20368/1908, 2373/1909, 4767/1909, 4768/1909, 4963/1909, 10462/1909 11932/1909, 29138/1909, 29459/1909, 370/1910, 2393/1910, 2394/1910, 12433/1910, 21199/1910, 25292/1910, 30104/1910, 316/1911, 7422/1911, 8013/1911, 11083/1911, 17129/1911, 18205/1911, 1441/1911, 23791/1911, 2037/1912, 16928/1912, 17322/1912, 19843/1912, 19989/1912, 8184/1913, 8767/1913, 10168/1913, 10380/1913, 12217/1913, 13110/1913, 16386/1913, 22313/1913, 14700/1913, 20714/1913, 21932/1913, 26236/1913, 29567/1913, 3796/1914, 8043/1914, 8666/1914, 9252/1915.

It was stated on behalf of the applicants that they had now applied for about 200 patents, which they were using for manufacture and research.

All the licences were granted.

CARBONATE OF MAGNESIA CONTRACT. *A. Harding* v. *G. F. Berry.*

Before Mr. Justice Bailhache in the Commercial Court on June 11, Messrs. Allen Harding, of Deptford, S.E., sued Mr. G. F. Berry, of Cullum Street, E.C., to recover damages for an alleged breach of contract as to the sale by the latter of light carbonate of magnesia.

The delivery was to be three tons a month from October, 1917, to March, 1918. None of the goods were delivered, and the defence was that in October, 1917, there was a mutual agreement that the whole contract should be cancelled. Further, the defendant disputed the claim for damages on the question of the difference between the contract and the prevailing market prices. The contract arose out of the defendant submitting a sample of light carbonate of magnesia to the plaintiff and offering to sell a quantity of this and of the heavier material. The plaintiff did not give an order, but later, when an inquiry was received from another firm, remembering the sample and the quotation of £55 per ton, he approached the defendant again, and he agreed to let the plaintiff have eighteen tons at £57 10*s.* The company was reselling to another firm at the same price, and this firm had a report from an analytical chemist that the stuff could not be considered as "light carbonate of magnesia." The plaintiff thereupon got into touch with the defendant, who said that the contract could not be departed from, but the plaintiff declined to take delivery unless the goods were of a higher quality.

Judgment was given for the defendant, with costs.

ANILINE DYE CASE. *George Kenyon, Ltd.*, v. *Bennett and Co.*

This dispute, which was heard by Mr. Justice Bray on December 5, 1917 (this J., 1918, 15 R), and decided in favour of the defendants, was carried to the Supreme Court of Appeal on May 16 last. Lords Justices Pickford, Bankes, and Scrutton concurred in dismissing the appeal with costs.

GOVERNMENT ORDERS AND NOTICES.

HYDROGEN ORDER.

The Lords Commissioners of the Admiralty, acting under the Defence of the Realm Regulations, have issued an Order, dated June 11, 1918, relating to the manufacture, sale, and supply of compressed hydrogen in the United Kingdom:—

(1) The manufacture, sale, and supply of compressed hydrogen is in future to be under the control of the Deputy Controller for Armament Production, Admiralty. (2) Particulars of manufacture, sales, and supplies, as specified in the Schedule (*v.i.*), are to be made as and when required by the Deputy Controller. (3) Intending purchasers of compressed hydrogen must also furnish returns to the Deputy Controller.

Schedule.

1. Type of plant, manufacture and process used.
2. The address and locality in which plant is situated, and what facilities for transport of compressed Hydrogen exist or are in contemplation.
3. Amount of free Hydrogen produced per week, stating how many hours the plant is working per week of seven days.
4. Maximum possible amount of free Hydrogen which can be made by the plant, stating how many hours worked per week of seven days.
5. Total amount of Hydrogen consumed at works, and for what purpose. Total amount of Hydrogen disposed of, to whom it is supplied, and for what purpose.
6. Purity of Hydrogen produced, stating what impurities exist and in what quantities.
7. Number, type, and free gas capacity of Hydrogen Compressors, stating what type of power is used to drive them, to what pressure they are capable of compressing Hydrogen, and how many hours per day and week of seven days each Compressor is being worked and/or is capable of being worked.

THE PAPER-MAKING MATERIALS (HOME-PRODUCED) ORDER, NO. 2, 1918.

This Order prohibits any person from buying or offering to buy except under permit from the Controller of Paper, or from selling or offering to sell except to the holder of such a permit any paper-making material produced or collected in the United Kingdom.

Producers may supply dealers and dealers may supply customers in the year ending March 31, 1919, with twice the amount of each of the same class of such materials as they supplied to such customers during the six months ended February 28, 1918, provided that reasonable notice of the requirements has been given. If the producer's or the dealer's stock is insufficient to meet all requirements, the stock must be distributed *pro rata* to the amounts supplied during the above-mentioned six months. The price charged by the seller must not exceed (without the written consent of the Paper Controller) the highest price charged for the same class of material in the six months stated above.

The owner of every factory in which paper, cardboard, millboard, etc., are made must make a weekly return to the Paper Controller of the quantities of materials delivered to him and of the names and addresses of the persons from whom the materials were bought and the prices paid.

The Order does not apply to waste paper as defined in an Order dated May 15, 1917, made by the Ministry of Munitions, or to sales or purchases of materials not exceeding 1 cwt. at one time unless part of a greater quantity.

The Paper-Making Materials Order, 1918, is revoked as from June 5.

DRUGS FOR THE TROOPS.

An Army Council Order dated June 5 revokes the Order dated May 11, 1916, and prohibits any person to supply to any member of His Majesty's Forces not being a registered medical practitioner or registered dentist or registered veterinary surgeon any of the following drugs:—Barbitone, benzamine lactate, benzamine hydrochloride, chloral hydrate, coca, cocaine, codeine, diamorphine, Indian hemp, opium, morphine, sulphonal and its homologues, and any salts, preparations, derivatives or admixtures prepared from or with any of the above drugs, except under certain conditions specified. The Order does not modify the requirements of the Defence of the Realm Regulation 40B in regard to opium or cocaine.

THE PLATINUM MINES ORDER, 1918.

The Board of Trade ordered on June 4 that Regulation 30 BB of the Defence of the Realm Regulations be applied to mines from which any ores of platinum are extracted.

OTHER ORDERS.

Road Transport Order, 1918. Board of Trade, June 4.

Kips and Calf Skins (Great Britain) Order, 1918. Army Council, June 4.

PROHIBITED EXPORTS.

An Order in Council, dated June 11, 1918, further amends and adds to the list of articles of which the exportation from the United Kingdom is prohibited, as follows:—

(1) *That the following headings should be deleted:—*

(B) Acetanilide; (B) Antimony, sulphides and oxides of; (C) Araroba or Goa powder; (B) Barium sulphate; (C) Chrysarobin; (B) Gentian root; (B) Hexamethylene tetramine (urotropin) and its compounds and preparations; (B) Hydrobromic acid; (C) Liquorice roots and juice; (B) Nux vomica and its preparations; (B) Emery and corundum and manufactures thereof, carborundum, alundum, crystolon and all other artificial abrasives and manufactures thereof; (B) Mustard.

(2) *That the following headings should be added:—*

(A) Acetanilide; (A) Aconite root; (A) Ajowan seeds; (A) Antimony, sulphides and oxides of, and mixtures containing sulphides or oxides of antimony; (A) Araroba or Goa powder; (A) Barium sulphate; (A) Calumba root; (A) Catechu; (A) Chrysarobin; (A) Gentian root; (A) Hexamethylene tetramine (urotropin) and its compounds and preparations; (A) Hydrobromic acid; (A) Liquorice root and juice; (A) Nux vomica; (B) Nux vomica, preparations of; (A) Quassia wood; (A) Emery and corundum and manufactures thereof, carborundum, alundum, crystolon and all other artificial abrasives and manufactures thereof; (A) Mustard; (A) Tin plate scrap, including scrapped and disused receptacles wholly or partly made of tin plate.

APPOINTMENT OF SUB-COMMITTEE ON GAS TRACTION.—In accordance with the recommendation of the Gas Traction Committee (this J., 1918, 186 R) an expert sub-committee has been appointed to carry out certain experimental investigations. The sub-committee consists of: Sir Boverton Redwood (chairman), Lieut.-Col. R. K. Bagnall-Wild, Mr. W. Worby Beaumont, Major A. McN. Cooper-Key, Prof. C. V. Boys, Major B. Hopkinson, Mr. E. S. Shrapnell-Smith, and Mr. S. Straker, with Mr. C. H. Lamb, of H.M. Petroleum Executive, as secretary.

REPORT ON ELECTRIC POWER SUPPLY.

The report of the Committee* appointed by the Board of Trade early in 1917 to consider the question of electric power supply "for all classes of consumers, particularly industries which depend upon a cheap supply of power for their development," to some extent covers the same ground as the interim report of the Coal Conservation Sub-Committee (this J., 1918, 40 R), and the recommendations of the two bodies are in general agreement.

The importance of providing cheap power throughout the country is strongly emphasised: "Such power is now seen to be virtually as essential as labour and materials in so far as it affects economical production. The value of the application of electricity to practically all classes of machinery and processes has been increasingly demonstrated in a striking manner during the war . . . . and the extent to which it may be further applied to cheaper and better mechanical production, to electro-chemical and metallurgical processes, etc., is altogether incalculable."

The following are the chief recommendations upon the lines of which immediate legislation is urged :—

That a new body, to be called the Electricity Commissioners, should be set up, to whom should be transferred the existing powers of the Board of Trade, Local Government Board, Local Government Board for Ireland, and Scottish Office, relating to the supply of electricity, and to whom large additional powers should be given for regulating and encouraging the generation and distribution of electricity.

That the Electricity Commissioners should, subject to an appeal to Parliament in certain cases, have general control over the generation and distribution of electricity in the United Kingdom.

That the existing system under which electricity is separately generated for small areas should be abolished.

That the Electricity Commissioners should, after local inquiries, divide the United Kingdom into districts technically suitable for the economical generation and distribution of electricity.

That in each electrical district a District Electricity Board should be set up which should purchase all generating stations of authorised distributors, whether local authorities, companies or power companies.

That the District Electricity Board should be responsible, by themselves or their lessees, for the future generation of electricity in their district and for the establishment of new generating stations and proper systems for the main transmission of electricity in their district.

That existing electrical undertakers should, if they so desire, retain their power of distributing electricity within their local areas, but should purchase electricity in bulk from the District Electricity Boards or their lessees, due provisions being made for controlling the profits of distributors, so as to ensure a cheap supply of electricity to consumers.

That District Electricity Boards should make no divisible profits.

That District Electricity Boards should be financed, in whole or in part, by funds raised with Government assistance, except where it is shown to be desirable and practicable to finance the Boards locally.

That largely extended powers should be granted for, *inter alia*: (a) The use of overhead wires; (b) wayleaves; (c) acquisition of water rights.

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* Cd. 9062, price 3*d*.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, June 6 and 13, 1918.)

OPENINGS FOR BRITISH TRADE.

A firm in Buenos Ayres and with connexions in other South American towns desires to obtain agencies for U.K. manufacturers of chemicals, drugs, etc. [Ref. No. 150.]

H.M. Consul-General at Valparaiso reports that paper and paper products to the annual value of £600,000 are imported into Chile and that the trade is worth the attention of U.K. manufacturers. A firm at Valparaiso wishes to communicate with U.K. paper manufacturers. [Ref. No. 153.]

British manufacturers of rough agate suitable for mortars and pestles, 4—5 in. diameter, are invited to apply to the Board of Trade for the names of British and foreign inquirers.

U.K. manufacturers of dressed and undressed leather desiring an agent in Lyons should communicate direct with the British Consulate-General, 8 Quai de l'Hospital, Lyons. [Ref. No. 156.]

An agent at Barcelona desires to take up agencies for U.K. manufacturers of machinery, rubber, chemicals, dyes, etc. [Ref. No. 158.]

An agent at Las Palmas will consider agencies for the Canary Islands for U.K. manufacturers of, *inter alia*, cement, chemical manures, foodstuffs, etc. [Ref. No. 159.]

TARIFF. CUSTOMS. EXCISE.

Argentina.—A presidential decree dated April 10 lays down regulations and formalities which have to be carried out by importers in the Republic in connexion with the admission, at a duty of 5%, of copper sulphate, and of oxides of zinc and iron and barium sulphate.

The Board of Trade is in receipt of the modifications for the month of June in the previous schedule of export duties on hides, quebracho logs, etc.

British India.—The export of mineral lubricating oils is now prohibited to all destinations, but the prohibition will, for the present, only be applied to imported oils.

Canada.—The import duty on certain kinds of hard soap has been revised and in addition a special "War Excise Tax" of 5% ad valorem is levied under the British Preferential Tariff and of 7½% ad valorem under the Intermediate and General Tariffs.

France and Algeria.—The French Consular visa on certificates of origin in connexion with goods for which French import licences are issued by the French Customs Office in London is still required in the case of those goods of which the importation from this country is subject to a rationing arrangement. These goods include soap (perfumed and other), candles, animal and vegetable oils and fats, stearic and oleic acids.

Malay States (Perak, Selangor, Negri Sembilan, Pahang).—The export duty on cultivated rubber and latex has been revised as from March 15, 1918.

Morocco (French Zone).—The exportation and re-exportation of pig skins have been prohibited.

New Zealand.—Animal hair may now be imported if accompanied by a declaration that the hair has been sterilised. The declaration must be on a form prescribed in these regulations. (*Bd. of Trade J.*, June 6.)

Southern Rhodesia.—The British South Africa Company's Government Gazette of March 22 gives

a supplementary list of Customs decisions relating to rates of duty leviable on, *inter alia*, leather dyes, stearic acid and sodium thiosulphate.

Sudan.—The import of gold is prohibited except under licence from the Financial Secretary, Sudan Government.

United States of America.—List of Restricted Imports, No. 2, is reprinted in the *Bd. of Trade J.*, June 13, as it contains further details as to the countries from which the import of certain items (including various chemicals) may be licensed.

COMPANY NEWS.

PROPOSED AMALGAMATION OF BRITISH DYES, LTD., AND LEVINSTEIN, LTD.

The proposed scheme for the merging of the interests of these important dye-manufacturing companies, referred to by the President of the Board of Trade in the House of Commons on May 15 (this J., 1918, 204 R), has been circulated among the shareholders of British Dyes, Ltd. After a preliminary meeting at the Board of Trade in February last, when the principle of immediate amalgamation was agreed upon, representatives of the two companies were appointed to elaborate a scheme to be submitted to the respective boards. The scheme, as outlined below, is considered by the boards to form an equitable basis for the amalgamation.

A new purchasing company, of which the nominal capital is to be decided later, is to acquire the assets of the merging companies in exchange for its own securities. The capital of the new company will be divided into: (a) Non-cumulative 7 per cent. preference shares; (b) preferred ordinary shares; and (c) deferred ordinary shares. The (b) shares are to receive 8 per cent., and after the (c) shares have received a like dividend the surplus profits are to be divided *pro rata* between the two classes. The "substantial capital" of each company, *i.e.* the actual value of the assets minus the liabilities, is to be paid for as to one-half in (a) and the other half in (b) shares. The (c) shares are to go in payment of goodwill (which will include payment under certain contracts), British Dyes, Ltd., receiving 55 per cent. of them and Levinstein, Ltd., 45 per cent. The Board of Trade will require certain provisions to be inserted in the Articles of Association of the proposed new company, in order to ensure British control, reasonable prices, and a fair distribution of products.

So long as the company is in possession of money on loan from the Government, the latter is to have two directors on the board (the total number of directors not being less than six), who, during their tenure of office, shall represent and exercise the powers of the Board of Trade. In addition to their voting rights as directors, the Government nominees are to have absolute power to veto any proposal or resolution of the board which might tend to encroach unduly on the trade of any British manufacturers of products other than dyes, or which might give undue preference to any customer or consumer of the company's products. While any Government loan or loans to the company are outstanding, the dividends on the (b) and (c) shares are limited to 8 per cent., and provision is to be made for the building up of a special sinking fund for the repayment of such loan or loans.

BRITISH DYES, LTD.

The above proposals were laid before a special meeting of the shareholders of British Dyes, Ltd., at Huddersfield on June 19, the chairman of the company, Mr. J. Falconer, presiding. In his opening remarks, the chairman expressed his dissent from a recent statement of Sir A. Stanley's, that lack of progress had been due to the dyemakers concentrating their efforts on dyes which could be produced in large quantities and comparatively cheaply. That had never been the policy of his company, which had directed its main attention to the manufacture of "intermediates." The only sure foundation of future success, said Mr. Falconer, was one of able, skilled engineers and chemists—other business and capable men could be added subsequently. His board had always favoured the policy of co-operation or amalgamation, and as regards the proposed new scheme the constitution of the board was one of vital importance.

Mr. G. P. Norton communicated the contents of a letter received by him last month from Dr. Levinstein, who suggested that the new board should consist of Lord Moulton as chairman, the two Government directors, Messrs. Turner and Norton representing British Dyes, and Mr. McGowan and the writer, Levinstein, Ltd.; Mr. Turner to be the commercial managing director and Dr. Levinstein the technical managing director.

Mr. H. Allen said that the Colour Users' Committee was practically unanimous in advocating the complete fusion of all the chief dye manufacturers in the country.

Mr. Milton Sharp announced that the Bradford Dyers' Association had adopted a resolution approving of the proposed amalgamation.

The chairman, in reply to questions, said it was obvious that unless the board was constituted as Dr. Levinstein wished, he (Dr. Levinstein) would not join it.

The proceedings terminated with the appointment of a shareholders' committee to inquire further into the scheme.

BRITISH COTTON AND WOOL DYERS' ASSOCIATION, LTD.

At the eighteenth annual meeting, held recently in Manchester, Mr. A. Hoegger, the chairman, referred to the enormous progress made by British dye manufacturers since 1914, and to the splendid help received from Swiss colour-makers. On the other hand, owing to the increased demands of the Munitions and Explosives Departments, supplies of chemicals have been more and more difficult to obtain, and at ever-increasing cost. There has also been much trouble in connexion with sizing materials in regard to quality, quantity, and cost. Scarcity of fuel, inexperienced labour, advances in wages, scarcity of raw cotton and wool, restricted shipping facilities, and the excess profits duty have all combined to handicap production; but, in spite of the probable continuance of these drawbacks for some time to come, he hoped to meet the shareholders again in a year's time with a satisfactory report.

BELL'S UNITED ASBESTOS, LTD.

Although work at the factories was interrupted through shortage of labour, and the difficulties of obtaining supplies of raw material from overseas further increased, the general results of the year's operations were satisfactory and fully equal to expectations. New machinery was erected for the manufacture of corrugated "Poilite" sheets for roofing and other purposes, and the proved success of this material should ensure for it an extensive use in place of corrugated iron. The War Department has requisitioned the whole of the company's output of "Poilite" building sheets and tiles, and its demand has reached the enormous total of 170 million square feet. Regular trade, both at home and abroad, in this material is, of course, in

abeyance. A serious consequence of the earlier restrictions on, and now the total suspension of, exports is that local factories have been erected in important foreign markets, which the company had established with much labour and at great expense, and this trade may be very difficult to recover.

The net profit in 1917 was £40,276, as against £44,800 in 1916, and the ordinary dividend is maintained at 15 per cent. Issued share capital and debentures amount to £259,000, and the reserve funds now stand at £131,300.

ROSARIO NITRATE.

The results of the financial year ended September 30, 1917, were eminently satisfactory. The quantity of nitrate upon which profit was taken was 1,349,000 quintals, yielding £148,000, compared with 1,220,000 quintals and a profit of £102,000 in the previous year. The gross profits rose from £117,980 to £148,873, but large sums are written off for various purposes, so that the net profit works out to £81,686, as against £80,937; the total dividend for the year, however, is raised from 15 to 17½ per cent., free of tax.

Speaking at the twenty-ninth annual meeting, held on May 22, the chairman, Mr. Arch. Balfour, deplored the concentration of the whole trade in the Government's hands; but strong and urgent representations have been, and are being, made, and there are good grounds for anticipating a favourable result—"a result which would cover the total production on fair terms, so that those interested in the trade could get a reasonable return on the capital invested in the industry." He then referred to the coming competition between mineral and synthetic nitrate, the outcome of which would be decided by the factors of price and efficiency. No data concerning cost of production of synthetic nitrate are available.

LAGUNAS NITRATE.

Although considerably increased profits were obtained in the year ended December 31 last, the dividend is maintained at 2*s*. per share, free of tax. The net profit was £54,394 (as compared with £31,100 in 1915), out of which £35,500 is placed to reserve and £18,000 is absorbed by the dividend. The cautious policy is probably due to the anticipation, stated in the report, that the present level of profits is not likely to be maintained, owing to lower prices for nitrate and increased cost of production.

CORRESPONDENCE

"ZIRCONIA AS A REFRACTORY."

SIR.—Dr. Rodd's article on the above subject, which appeared in the issue of the Journal dated June 15, rather gives the impression that nothing is being done in this country to develop zirconium commercially. It might interest your readers, and should, I think, be stated, that white zirconium oxide, practically pure, is now being manufactured in this country by the Zirconium Syndicate, Limited.

The production of zirconia on a substantial scale and at a commercial figure has, I believe, never been accomplished before outside Germany, and I feel sure that Dr. Rodd and your readers will be glad to know that this difficult problem has now been overcome by a British undertaking.

I am, Sir, etc.,
H. EDWIN COLEY
(Chairman, Zirconium Syndicate, Ltd.).

June 20, 1918.

TRADE NOTES.

FOREIGN.

Sweden.—H.M. Minister at Stockholm reports that the fusion of Swedish glass works has now been further expanded, and has resulted in the formation of a company with a capital of 6,000,000 kronor as a minimum and 18,000,000 kronor as a maximum. The combine now embraces practically the entire Swedish window glass industry.

The Swedish charcoal producers have associated themselves into a company, with a minimum capital of 2,000,000 kronor and a maximum of 6,000,000 kronor, with the object of protecting their interests. —(*Bd. of Trade J., May* 9, 1918.)

Cuba.—The total trade of this island for the year ended June 30, 1917, was valued at £123,683,400, of which £52,275,400 represented imports and £71,408,000 exports. The values of the principal exports were: Sugar (all kinds, including molasses), £56,327,000; tobacco, £5,463,200; and mineral products, £2,420,200. As regards imports, food supplies were valued at £15,926,000; tissues and manufactures thereof at £6,031,000; machinery, £5,332,200; metals and metal manufactures, £2,033,800; and chemicals and chemical preparations, £2,346,600.—(*Bd. of Trade J., May* 16, 1918.)

* * *

Russian Oil Industry.—According to information issued by the Russian Ministry of Supplies the imports of oils and fats during 1917 were exceedingly small, and bean oil, olive oil, and coconut oil were not obtainable. The quantities of fats and other oils consumed were estimated as follows: Butter, 73,700 tons; other animal fats, 122,800 tons; sunflower oil, 147,400 tons; and linseed oil, 49,100 tons.

Fat Industry in Sweden.—The "Aktiebolaget Fettindustrie" has been formed in Malmo with a capital of 5 million kronor (about £280,000) for the recovery of oils, etc., from bones, fish waste, and carcases. Another recent flotation is the Aktiebolaget Fiskmjöl, which is expected to produce some 400 tons of cod liver oil yearly. It will also develop the seal fishing industry, and utilise herrings for the extraction of fat, of which the intestines contain 12—15%.—(*Chem. Umschau, No.* 5, 1918.)

Cienfuegos (Cuba) in 1916.—This is above all a sugar producing colony, sugar and molasses providing over 99% of the total exports for 1916, which were valued at nearly £16,000,000. The yield of sugar was good and as prices ran high, the year was a very prosperous one. Imports included 250,522 lb. of calcium carbide, 1,504,952 lb. of acids, 2,010,269 lb. of fertilisers, 374,519 lb. of oxides, and 430,095 lb. of paints. It is to be noted that most of the trade is in the hands of Spaniards.—(*U.S. Com. Rep., Mar.* 25, 1918.)

Madagascar (French East Africa) in 1916.—The greatest increase in the industrial activities of this colony was in the graphite workings, 25,480 tons of the mineral being produced as against 15,000 tons in 1915. The production for 1917 is estimated at 30,000 tons. Corundum was also mined in increased quantities, 1532 tons being exported as against 334 tons in 1915. Gold, however, showed a decrease of 27%, the production being 48,719 troy oz.

Trade in general showed a large increase; the imports included 1613 tons of chemicals, valued at £34,000; 84 tons of medicinal products, valued at £14,500; 248 tons of paints and dyes, valued at £17,500; and 1042 tons of unscented soap, valued at £31,400.

The export trade was hampered by lack of tonnage. In addition to the mineral trade mentioned above there were exported 839 tons of beeswax,

85 tons of cacao, 204 tons of cloves, 364 tons of oil fruits and seeds, 21,978 lb. of volatile and essential oils, and 477,620 lb. of vanilla.

The greater portion of the trade is controlled by France, which supplied 58% of the imports and received 72% of the exports.—(*U.S. Com. Rep. Supp., Mar.* 4, 1918.)

Réunion (French East Africa) in 1916.—This colony depends principally on its production of sugar, of which 42,152 tons was shipped in 1916, of a value equivalent to 72% of the entire exports. Other exports included 188,980 lb. of geranium and other essential oils, valued at £87,000, and 144,968 lb. of vanilla, valued at £56,000.—(*U.S. Com. Rep. Supp., Mar.* 4, 1918.)

Portuguese East Africa in 1916.—The main products of chemical interest of this colony are copra, oilseeds, oils, and sugar. The total exports of these products in 1916 were as follows: Copra, 9,723,319 kilo.; oilseeds (castor, mafureira, peanut, sesame, and cotton), 10,587,424 kilo.; oils (castor, coconut, mafureira, peanut, and sesame), 159,265 kilo.; and sugar, 6,967,959 kilo.

The imports included 137,174 kilo. of chemical products, 24,200 kilo. of perfumes, 58,550 kilo. of soap, and 33,852 kilo. of zinc. Most of the trade of this colony is with Portugal and the United Kingdom.—(*U.S. Com. Rep. Supp., Mar.* 11, 1918.)

Proposed Caustic Soda Industry in Brazil.—A telegram from Rio de Janeiro states that, with the object of introducing the caustic soda industry into Brazil on a large scale, the Government has promulgated a decree allowing loans to the first three companies which establish factories producing not less than 500 tons a year. The loans will not exceed 2,000 contos of reis (2,800,000 francs), at 5 per cent. interest, in the proportion of 75 per cent. of the value of the factory. They will be redeemable by annuities in the maximum period of ten years.—(*So. Amer. J., June* 1, 1918.)

Hong-Kong in 1917.—The supply of chemical goods to this district has long been in the hands of European firms with British and Continental connexions, which are largely dependent on this export trade. A determined effort to capture this market is being made by American firms, which during the war have developed a considerable trade in standard chemicals, dyes, heavy chemicals, soda ash, caustic soda, potash, coal tar chemicals, and all similar goods, much of which they hope will prove permanent. The trade in American-made dyes is considered to be particularly promising. American pharmaceutical goods have also made much headway and the imports of paint from the U.S.A. have increased.

Exports of peanuts, hides, ginger, vegetable and essential oils all increased, as did fibres, chemicals, antimony and wolfram. The exports of chemicals to the U.S.A. were valued at £70,000. Spices and cassia were also exported, but in decreased quantities.—(*U.S. Com. Rep., Mar.* 21, 1918.)

Cette (France) in 1916.—The manufacturers of chemical products in this region made large extensions to their plants during 1916, to meet both their ordinary trade and the demands of the Government for war material. The chief products were chemical fertilisers and fungicides for the vineyards. There are also two sulphur refineries in the district which produced 28,500 tons of refined sulphur in the year ending July 31, 1916.

The coal mines of this region are the most important in Southern France. The German occupation of the mines in the north and east has stimulated the production of the southern mines, 2,125,478 tons being produced. In addition, 383,251 tons of iron ore and 23,412 tons of bauxite were mined.—(*U.S. Com. Rep. Supp., Mar.* 12, 1918.)

REVIEW.

THE ALKALI INDUSTRY. *By J. R. Partington, M.Sc. Pp.* 304. *(London: Baillière, Tindall & Cox.) Price* 7*s.* 6*d.*

This is one of a series of volumes, edited by Dr. Rideal and designed to give a comprehensive survey of the chemical industries. The books are intended essentially for those possessing no special technical knowledge, for students, and for men engaged in chemical industry, who have specialised within narrow limits. Thus, as the author states in his preface, the book under review is to be regarded as an introduction to, and also as supplementing, the larger and more technical treatises.

It deals with the manufacture of salts of sodium, potassium, ammonium, lithium, and magnesium, together with the manufacture of sulphuric acid and nitric acid and of allied products such as chlorine and bleaching powder. The author has had a difficult task in compressing all this into 300 pages.

The section on sulphuric acid occupies 44 pages, of which 20 are devoted to the lead chamber process, purification and concentration, the remainder being allotted to contact processes and a short consideration of the law of mass action and applications of thermodynamics. For quite a number of years there has been considerable progress made in the methods employed in connexion with the lead chamber process, and, whereas the chamber space used to be universally 20 cub. ft. and more per lb. of sulphur burnt per 24 hours, a different state of things prevails at the present time; more intensive working has resulted in a gradual reduction of the chamber space; the introduction of water-sprays, followed naturally by a considerable increase in the height of chambers—in some cases up to 40 ft. even in rectangular chambers—has played a considerable part in the development of the process, such sprays being now quite a common feature, as applied not only to new plants but also to many older plants, where, moreover, opportunity has been taken at repair periods to increase chamber height. Lead chamber plants of the rectangular type are in quite a number of instances worked on a space of 10 cub. ft. per lb. of sulphur per 24 hours. Mills-Packard conical chambers work at considerably less than this. To have to compress a description of the lead chamber process into so few pages is unfortunate, and a fuller consideration of the progress of the past fifteen years would appear to be essential, if the book is to be put into the hands of students. At the same time, there are items relating to earlier days, which might be omitted as tending to give to the uninitiated a false idea of their relative importance.

Spent oxide is used extensively for the production of sulphuric acid, and, by reason of its special characteristics, it merits quite as much attention as brimstone, which in this country is now used scarcely at all in the lead chamber process.

The sub-section on sulphuric acid concentration suffers, too, from excessive condensation; the Kessler process, used in a considerable number of large works, is dismissed in nine lines.

In the portion dealing with the absorption of hydrochloric acid the author has somewhat confused the provisions of the Alkali Act, which requires that exit gases (to atmosphere) must not contain more than 0·2 grain of HCl per cub. ft.—the 4-grain total acidity limit refers to the exit from the sulphuric acid (lead chamber) process, not to the salt-cake plant. The statement that the hot gases from the salt-cake furnaces may be cooled by passing through batteries of tubes made of iron is apt to be misleading without further explanation as to the extent of the cooling.

Having regard to modern conditions too much prominence is given to the Weldon chlorine process as compared with the Deacon process; to maintain a true balance in a book of this type is perhaps difficult.

The section on nitric acid manufacture (36 pages), which includes a consideration of the work done on the production of nitric acid from atmospheric nitrogen, brings together much valuable information concerning modern developments. Forty pages on ammonia and ammonium salts furnish, too, a good deal of information, in which is included, one is glad to see, details concerning nitrogen fixation processes. Thirty-seven pages are devoted to the oxidation of ammonia with production of nitric acid, a subject on which there is yet much work to be done.

Each section is followed by a series of references to the literature of the subjects dealt with.

On the whole one cannot but feel that much over-condensation should have been obviated, especially in the first half of the volume.

T. L. BAILEY.

OBITUARY.

T. W. LOVIBOND.

BORN OCTOBER, 1848.——DIED MAY, 1918.

Thomas Watson Lovibond, an original member of this Society, was born in Somerset, and at the early age of fourteen entered the Greenwich Brewery, founded by his father. Taking a keen interest in all the work of the brewery he specialised in the practical branch, and early became head brewer, and, before his father's death, a partner. In 1881 he took the bold step of resigning his partnership to study scientific brewing under Prof. C. Graham at University College, London. After three years' hard study, as student and demonstrator, he resumed his original calling, becoming head brewer at Richardson's brewery at Newark-on-Trent, and subsequently managing director, and chairman, of "The Newcastle Breweries, Ltd." A man of great energy and broad outlook, Lovibond was eminently successful in all he undertook, and he was ever ready to give of his best to the needs of the brewing industry and of the various societies connected therewith. He became chairman of the Country Brewers' Society in 1899-1900, of the Brewers' Society in 1908-10, and was for many years the valued chairman of the Parliamentary Committee of the latter society. He also took a great interest in the Institute of Brewing, of which he was president in 1916-17. Socially as well as publicly he was most popular, and his loss is mourned by a very large circle of friends. L. T. T.

J. W. LOVIBOND.

BORN NOVEMBER, 1833.——DIED MAY, 1918.

Joseph William Lovibond, an elder brother of T. W. Lovibond, was also a well-known figure in the brewing industry. He worked with his father at Greenwich from 1854 until 1869, when he took over the Salisbury branch, becoming a director and later chairman.

In the 'seventies his mind turned to the question of the measurement of colours, and the result of many years' work was the Lovibond Tintometer which has been adopted in so many trades and industries as the standard instrument for colour measurement. During the latter years of his life Joseph Lovibond spared neither energy nor money in perfecting this instrument and the series of standard glasses which form its most essential feature. Chemical industry owes him a debt of gratitude for an instrument which not only makes easy and accurate the comparison of colours at distant times and places, but also helps greatly in the analysis of colour. During the present war Lovibond's thoughts naturally turned to the use of his knowledge of colour to reducing the visibility of objects, and much of the "camouflaging" adopted by the army and navy is due to his investigations. He contributed a number of important papers connected with the measurement of colour to this journal and published several books on the same subject.

L. T. T.

PUBLICATIONS RECEIVED.

DIRECTIONS FOR A PRACTICAL COURSE IN CHEMICAL PHYSIOLOGY. *By* W. CRAMER. *Pp.* 119. *(London: Longmans, Green and Co.,* 1917.) *Price* 3s.

INDIAN MUNITIONS BOARD HANDBOOK. *Exhibition of Foodstuffs and Household Requisites,* 1917. *Pp.* 184. *(Bombay: The Times Press.) Price* 1 *rupee.*

THE MADRAS EXHIBITION OF INDIAN ARTS AND INDUSTRIES, 1917. *Second Edition. Pp.* 416. *(Published by the Committee, People's Park, Madras.) Price* 8 *annas.*

CHEMISTRY FOR BEGINNERS AND SCHOOL USE. *By* C. T. KINGZETT. *Third Edition. Pp.* 211. *(London: Baillière, Tindall and Cox.) Price* 2s. 6d.

PRACTICE OF PHARMACY. *By* J. P. REMINGTON. *Sixth Edition. Pp.* 1987. *(Philadelphia and London: J. B. Lippincott Co.) Price* 35s.

UNITED STATES DISPENSATORY. *By* J. P. REMINGTON *and* H. C. WOOD, JR. *Twentieth edition. Pp.* 2010. *(Philadelphia and London: J. B. Lippincott Co.). Price* 50s.

METHODS OF MEASURING TEMPERATURE. *By* EZER GRIFFITHS, *with an introduction by* PRINCIPAL E. H. GRIFFITHS., F.R.S. *Pp.* 176. *(London: Charles Griffin and Co., Ltd.) Price* 8s. 6d.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, &c., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and the Calendar of Forthcoming Events, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 7331. *Telegraphic Address: Induchem, Finsquare, London.*]

METHYL ALCOHOL.

The changes now taking place in many branches of chemical industry are so numerous and important that it is no easy matter to estimate their relative importance; and there is a risk that the significance of some of the less conspicuous movements may be overlooked owing to the very modesty of their appearance. As a case in point we may instance the movement to obtain a modification of the restrictions on the use of pure methyl alcohol, which in the past has been somewhat overshadowed, not to say obscured, by the attention devoted to the larger and more complicated question of ethyl alcohol. The Report recently issued by the Association of British Chemical Manufacturers, therefore, comes as a timely reminder of the importance of the subject, and, at the same time, it bears witness to the efforts which are being successfully made to remove certain restrictions detrimental to the welfare of the fine chemical and related branches of chemical industry.

The Report in question, which has been prepared by the Methyl Alcohol Committee appointed by the Industrial Alcohol Committee of the Association, consists of a statement of the case for permission to use pure methyl alcohol, undenatured, in approved chemical industries; and its gist is contained in the opening paragraph which embodies a plain straightforward request for the free use of such alcohol under similar conditions for which permission is at present granted for the use of industrial spirit. A very strong case in support of this request is presented, especial prominence is given to the evidence for the toxic character of pure methyl alcohol, and a complete review of the relevant literature is provided in an appendix (see this J., 1918, 26 T.). This evidence in itself is sufficiently strong to justify the consideration of methyl alcohol as a question distinct from that of ethyl alcohol. Since the writing of the Report additional evidence has been accumulating, *e.g.*, in the issue of this Journal for June 15 last (p. 318 A) six cases of poisoning by whisky adulterated with methyl alcohol were quoted from the *American Journal of Pharmacy*.

In spite, however, of all the weight of evidence, the Board of Customs and Excise has not, so far, approved of the removal of all restrictions on the use of pure methyl alcohol, for fear of the possibility of its use as an adulterant of potable spirit. Nevertheless, it is satisfactory to note that the principle of the request was conceded by the Chancellor of the Exchequer in a reply made to Sir Wm. Pearce in Parliament on April 29 last (this J., 1918, 180 R).

Owing to the present shortage of methyl alcohol, no immediate advantage of the promised concessions can be taken, but in due course there will undoubtedly ensue a great development in the production of those fine chemicals into the manufacture of which the use of pure methyl alcohol enters either as a solvent or as a reacting substance.

The extent to which the British fine chemical industry has been handicapped in the past as compared with the industry in Germany, where there are no restrictions on the use of pure methyl alcohol, is briefly indicated in the Report, which also points out that the British manufacturer has, in consequence, been driven to conclude arrangements with manufacturers in other countries. "The manufacture of fine chemicals," says the Report, "involves an infinite variety of comparatively minor operations." In the majority of cases the actual quantity of pure methyl alcohol required for a given operation is comparatively small and the manufacture is not continuous. On the other hand, the aggregate number of such operations is large and represents a substantial bulk of methyl alcohol required.

Under the old regulations, special application had to be made in every case where it was required to use methyl alcohol, suitably denatured, and this circumstance undoubtedly acted as a deterrent to even the most progressive among fine chemical manufacturers. No single denaturant (or even several), the Report continues, can be found which would be of such universal applicability that the alcohol could be employed in a wide range of small manufacturing operations.

The modification of the restrictions on the use of pure methyl alcohol will, presumably, lead to a more extensive demand for it which should greatly stimulate the home production. Hitherto, little or no pure methyl alcohol has been produced by the British wood distiller, and owing to the excise restrictions the production of wood alcohol has been limited to the lower grade quality suitable only for denaturing purposes and varnish making—this quality being non-dutiable. The wood distiller, like the fine chemical manufacturer, claims that methyl alcohol is so toxic that all excise control should, and can, be safely removed, and as the authorities have apparently arrived at no decision on this phase of the question, it is probable that more will be heard from the distillers in future. Wood distillation has long been a "Cinderella" amongst the chemical industries of this country, and it has needed the war to make us realise the mistake of allowing an industry to fall into decadence, the products of which are only second in importance to those of the great sister industry—coal tar distillation.

The Association of British Chemical Manufacturers is to be congratulated on the success which has met the first steps in its campaign to deal with the Industrial Alcohol question.

ELECTROLYTIC METHODS FOR THE PREPARATION OF HYDROGEN PEROXIDE.

E. B. R. PRIDEAUX.

From persulphuric acid and persulphates. The method which will be considered first depends upon the production of persulphuric acid or persulphates with subsequent conversion into hydrogen peroxide in the manner to be described. The history and theory of persulphates are fully given in "Per-acids and their Salts," by J. S. Price (Longmans). The conditions which are necessary for the preparation of persulphuric acid, $H_2S_2O_8$, as stated in the literature and in the patents of the Consortium f. Elektrochem. Ind., E.P. 23,548 (1910), 23,158 (1910), 23,660 (1910), are as follows:—

(a) The density of the sulphuric acid should be between 1·35 and 1·5.

(b) The electrolysis should be carried out as rapidly as possible.

(c) The current density should be high—about 100 ampères per $(\text{dcm.})^2$.

(d) The solution must be cooled, or better the inside of the hollow anode, by the circulation of water at 15°—20° C.

(e) The anode should be of smooth platinum. The weight of metal required is small if the anode be suitably constructed. It gradually loses its efficiency, which may be restored by ignition.

(f) The potential difference between the anode and the solution must be high. This condition,

which is observed by measuring the potential difference between the anode and a standard, *e.g.*, calomel, electrode dipping in the solution, is most important for success. It depends greatly on the nature of the metal surface, see (e), and also on the compounds present in the solution.

The formation of permonosulphuric acid from persulphuric acid—

$$H_2S_2O_8 + H_2O = H_2SO_5 + H_2SO_4$$

reduces the yield by lowering the anode potential (as well as in other ways). It has even been found desirable, by adding H_2SO_3, to destroy this acid, although it would afterwards give H_2O_2. Additions of either HCl, HF or $NaClO_4$ also raise the anode potential and greatly improve the yield. In the patents mentioned above it is claimed that $H_2S_2O_8$ of over 40% has been obtained with a current yield of over 50%. If the persulphuric acids are to be used subsequently for the production of H_2O_2 the presence of these substances may introduce complications.

Persulphates. The conditions for the preparation of soluble persulphates are very similar to those given, except that it is not so necessary to maintain a low temperature. The persulphates of potassium and ammonium being sparingly soluble are easily prepared in the solid state. The yields are said to be good, thus solid $(NH_4)_2S_2O_8$ can be made at a current density of 300 ampères per $(dcm.)^2$ with a current efficiency of 70%.

Hydrogen peroxide from persulphates. Acid solutions of persulphates obtained by electrolysis, or by treating solid persulphates with sulphuric acid, are converted on warming into permonosulphuric acid (equation above), and this into hydrogen peroxide. The solutions must contain a fairly high concentration of sulphuric acid, in order that the $H_2S_2O_8$ may be converted into H_2SO_5. The change of $H_2S_2O_8$ in 40% H_2SO_4 is rapidly effected. The concentration must not be too great, however, since the reaction is to some extent a balanced one and in solutions between 85% and 58% H_2SO_4, the H_2O_2 forms H_2SO_5 again. [Baeyer and Villiger, Ber., **33**, 124, 858, 1569 (1900); Price, "Per-acids, etc.," pp. 20, 21.]

A moderately high concentration of sulphuric acid is also required in the distillation, since dilute solutions when distilled under reduced pressure give a distillate which is almost pure water, and the hydrogen peroxide does not come over until the end of the distillation. These considerations also hold in the main for solutions containing alkali sulphates and persulphates. The amount of sulphuric acid in the solutions must be regulated in order to obtain a good yield and a concentrated distillate, and also to allow the distillation to proceed fairly quickly at a safe temperature. The general conditions affecting the stability of H_2O_2 must also be carefully observed. The solution must not contain salts of copper, iron or manganese. It must be free from dust and organic matter. Traces of platinum derived from the electrodes also catalyse the decomposition of H_2O_2, and particularly so in the presence of H_2SO_5.

$$H_2SO_5 + H_2O_2 = H_2SO_4 + H_2O + O_2$$

In the patent of Teuchner, E.P. 24,507 (1905), these small quantities of platinum are removed by the addition of aluminium, the salts of which are said to have no catalytic effect upon the decomposition of hydrogen peroxide.

The most successful conditions of distillation appear to be those embodied in the patents of Pietzsch and Adolph, E.P. 23,158, 23,660, in which acknowledgment is made of the work of Friend and Price (J. Chem. Soc., **85**, 1526 and 1533).

Persulphates (of potassium and ammonium) are distilled with sulphuric acid, giving H_2O_2 of high concentration. The reactions which occur are—

$$K_2S_2O_8 + H_2SO_4 = K_2S_2O_7 + H_2SO_5$$
$$H_2SO_5 + H_2O = H_2O_2 + H_2SO_4$$
$$K_2S_2O_7 + H_2O = 2KHSO_4$$

It will be seen that the amount of H_2SO_4 is unchanged during the reaction, since the $KHSO_4$ separates as a solid. The equations may be summarised as follows:—

$$K_2S_2O_8 + 2H_2O = 2KHSO_4 + H_2O_2$$

Water is introduced continuously, and the H_2O_2 is distilled as fast as formed, at a high concentration and with little loss. Commercial sulphuric acid may be used.

By this means 96% of the theoretical yield of H_2O_2 from $K_2S_2O_8$ may be obtained as a 20% solution.

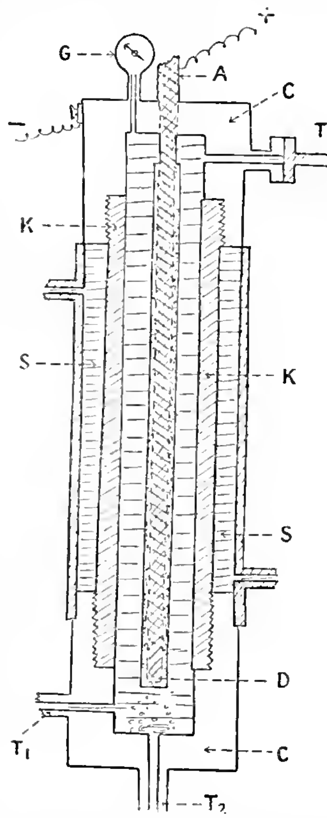
Experiments carried out by the author on the electrolysis, followed by distillation, of acid sodium sulphate, have shown that it is quite easy to obtain 12 grams of H_2O_2 per kilowatt hour as a 3% solution, and much larger yields could be obtained if the process were worked on a larger scale, and with the addition of HCl, HF, etc., as mentioned above. The conditions however are on the whole more favourable in the case of potassium or ammonium salts. On the large scale 1 kilogram of $(NH_4)_2S_2O_8$ is said to be produced by 2·4 K.W.H. Assuming a 96% efficiency of conversion into H_2O_2 and distillation, as above, it is seen that 1 K.W.H. produces about 60 grams of H_2O_2.

By the oxidation of kathodic hydrogen. According to an observation of Traube the hydrogen peroxide produced at the kathode by the electrolysis of dilute acids is easily oxidised to H_2O_2 by gaseous oxygen. This phenomenon was further investigated by Franz Fischer and Priess (Ber., **46**, 698, 1913). They used a mercury kathode in dilute sulphuric acid and found that the yield of H_2O_2 was nearly theoretical, but only at very low current densities. Traube had used less than 0·2 ampères per square decimetre. As soon as the concentration of H_2O_2 rose it was destroyed at the kathode. The current yield was much increased by using oxygen at a high pressure. Thus with a current density of 7·5 amps. per $(dcm.)^2$ the current efficiency was only 0·1% using atmospheric oxygen but rose to 90% when oxygen at 100 atmospheres pressure was passed through the cell. Air at high pressures may also be used. Since however it is the partial pressure of the oxygen which is effective, air at 100 atmospheres is only equivalent to oxygen at 20 atmospheres. As the engineering difficulties increase in high proportion with increase of pressure it seems preferable to use oxygen, especially so since the excess of this is not wasted but continuously circulated as described below.

These discoveries have been utilised in devising the apparatus described in patents E.P. 10,476 (1913), 22,714 (1914) taken out on behalf of Henkel & Cie. In the patented electrolysing cell, the electrolysis can be carried out under a high pressure of oxygen, the solution being pumped through the apparatus by means of pressure pumps. The following details have been selected from both patents as well as from the original paper by Fischer in order to make the account of the process less incomplete. (See also Bornemann, Z. anorg. Chem., **34**, 1—42, 1903.) The solution was dilute sulphuric acid (1%) or phosphoric acid or boric acid. The two latter do not give such good yields, but it is sometimes of advantage to have a product free from sulphuric acid.

The kathode surface is copper or silver on a suitable metal (second patent), or deposited on unglazed porcelain (first patent). The anode is of carbon or magnetite (first patent). The interior of all parts which come in contact with the electrolyte, *i.e.*, the cell itself and the force pumps must be covered with something which resists the effect

of acid saturated with oxygen at a high pressure. Gold or rubber is mentioned. The cell consists of a metal kathode tube K 60 to 75 mm. thickly coated on the inside with the amalgam. The ends of this are closed gas tight by screw caps C, of which the lower one carries the inlet tubes for the dilute acid T_1 and compressed oxygen T_2; the upper one the anode A, the pressure gauge G, and the outlet tube T_3. The outside of the kathode tube is well cooled by the circulation of cold salt solutions S. According to the first patent the solution with oxygen was circulated first over the anode, then through the kathode tube in which the H_2O_2 was produced up to a concentration of about 3%, or up to 4·8 with a lower current yield. In the second patent the liquid may be circulated several times through the kathode compartment of the



same cell, or of several cells in each of which the H_2O_2 concentration is increased. The current and energy efficiencies of the process are indicated in the original paper referred to above. By a calculation from the small quantities obtained in the experimental cell, it is said that 350 grams of H_2O_2 are produced by 1 K.W.H. Consequently the voltage must have been very low. The H_2O_2 is in the form of a 2·7% solution in dilute H_2SO_4, and if it is to be obtained in pure aqueous solution it is still subject to distillation losses. The energy efficiency would appear on the whole to be rather higher than in the case of the persulphate processes. The high oxygen pressures will require a plant relatively costly in the first instance and difficult to maintain in good working order. With the lower current density the electrolytic product is formed more slowly in apparatus of a given size. Distillation losses will occur in this as well as in the persulphate process, unless the peroxide is prepared and used in boric acid solution. The value of the by-products of the persulphate process—hydrogen and some ozonised oxygen —must also be taken into consideration.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

The meeting held at Sheffield on June 19, with Mr. W. F. J. Wood in the chair, was devoted to the discussion of a number of important resolutions relating to industrial policy. Of the five resolutions put forward, (1) asked for the continuance of the Optical and Glassware Department of the Ministry of Munitions after the war, with functions similar to those it is now exercising; (2) demanded prohibition of imports, except under licence, on the lines of the recommendations of Lord Balfour of Burleigh's Committee (this J., 1918, 207 R); (3) laid down the desirability of imposing protective tariffs against unfair labour competition and "dumping"; (4) affirmed the desirability of effecting a federation of the eight trade sections of the glass industry, the federation to include representatives of masters, men, science, engineering, finance, and Government departments, and other bodies concerned. The resolutions which were proposed *en bloc* by Mr. S. M. Jenkinson, and seconded by Mr. J. Connolly, were all carried.

Mr. Jenkinson deplored the inefficiency of the glass industry in this country in comparison with other countries, and urged the necessity of the Society taking a definite lead. Industry must have its own councils, and such questions as tariff reform and protection must not be tabooed because they belong ostensibly to politics. Mr. Connolly thought the good work done by the Government departments justified their continued existence after the war; nevertheless the industry must reform itself and bring out the talent which now lies hidden. In pre-war days the average wage in the British glass trade was about twice as high as that in enemy countries, and many German and Austrian works were run entirely for the British trade. Our glass trade was worth saving and all the resolutions would help in this direction.

Mr. E. J. P. Benn, of the Ministry of Munitions, in agreeing with much that had been said by the President and the other speakers, said that in future the industries of the country will be in closer touch with Government departments. It was very difficult for the latter to get into touch with the right bodies, and each trade must have an independent body of its own to advise the department concerned—hence the formation of Interim Committees.

Mr. J. E. Foxon, President of the National Federation of Glass Bottle Workers, supported the resolutions in their entirety. He appealed for better conditions for the workman and advised the formation of Works Committees. Such committees had been compulsory in German works since 1916, and the expense of them was borne by the masters. The suggestion that the men hindered output was quite wrong, and there was no doubt that they favoured tariff restrictions. The resolution advocating federation was the most important. The labour side of the industry should have more representation on the Optical and Glassware Department of the Ministry.

Mr. W. Butterworth opposed the resolutions as being outside the scope of the Society's activities. The failures of the past were due to lethargy of the manufacturer and conservatism and shortsightedness of the worker. The great need of the industry was technical equipment. There should be free competition, and Government aid should be restricted to providing technical education, increased transport facilities, and commercial propaganda and intelligence. In supporting the last speaker, Mr. Redfern moved an amendment to resolution (1) limiting its scope to the development of the research side of the industry. He also

moved to amend resolution (2) by defining the "key" industries, and to amend resolution (4) by cutting it out altogether. Mr. W. J. Rees considered all the resolutions *ultra vires*.

Mr. C. J. Peddler, in supporting the resolutions, maintained that scientists would only be attracted to an industry which was prosperous, and hence scientific men should support the resolutions. Mr. F. Swann, speaking as a representative of labour, agreed with all Mr. Foxon had said.

The amendments of Mr. Redfern met with little support, and, as stated above, all the resolutions were carried.

The two following papers were taken as read:—(1) "The Behaviour of Different Types of Foreign Chemical Glassware towards Corroding Agents," by J. W. Canwood and W. E. S. Turner. (2) "A Simple Device for Rapidly and Accurately Calibrating Pipettes," by S. English.

NEWS AND NOTES.

AUSTRALIA.

Queensland Sugar Crop.—Mr. Watt, acting Prime Minister, when announcing the purchase of the Queensland sugar crop for this and the next season, said that the amount involved was £16,000,000. The retail price of 3½*d*. per lb. for capital cities would continue.

Bendigo Goldfields.—The Victorian Cabinet has agreed to subsidise a syndicate to the extent of ten thousand pounds for the further development of the Bendigo Goldfields. The syndicate itself is spending twenty-five thousand pounds.

Papua.—Judge Murray, Lieut.-Governor of Papua, on his annual visit to Melbourne, said that exports of rubber and coconuts produced by the plantations formed since the Commonwealth took control in 1907 had been doubling themselves in recent years; a big copper deposit 17 miles from Port Moresby was being opened up at which the outlook was very good.

Extraction of Arsenic in Queensland.—Work on the arsenic mine in the Stanhope district (this J., 1918, 56 R) is proceeding steadily, and the results achieved are so satisfactory that the Queensland Government intends to erect a roasting plant, estimated to cost £5000, and to be made in Australia.—(*Bd. of Trade J., June* 27, 1918.)

New South Wales Mineral Production.—Preliminary figures indicate that the mining output for 1917 will probably reach that of the previous year, which was £10,975,000 and the third highest record figure from this State. The aggregate value of the mineral products of New South Wales now amounts to £283,000,000, coal having contributed £86,000,000, silver-lead £79,000,000, and gold £62,000,000.

The copper exported during the first six months of 1917 showed an increase of £594,450 over the corresponding figure of last year. Large works have been erected at Port Kembla for the manufacture of copper wire and other goods of the same metal.—(*U.S. Com. Rep., April* 4, 1918.)

Clay Deposits in West Australia.—West Australian clays have received renewed attention of late for pottery-making and other purposes. It is stated that there is a deposit of high-class china clay within a few miles of Kalgoorlie, while unlimited quantities of material suitable for tile-making, etc., are said to exist at Kanowna, Bulong, and other centres.—(*Austral. Ind. and Min. Stand., Mar.* 28, 1918.)

Hydro-Electric Enterprises.—The electrical industry in the Commonwealth is the subject of a long communication from H.M. Trade Commissioner in Australia. The number of establishments in 1915 was 247, the approximate value of plant and machinery £5,437,000, and the electric power produced 348,123,000 British units. The value of the water powers of Australia is meeting with increased recognition, particularly in Tasmania, where important hydro-electric installations have been established, and where there is relatively more water power available than on the mainland. The most important scheme in operation is controlled by the Hydro-Electric Department of the State Government. The Electrolytic Zinc Company is expending about £200,000 on plant, and the present installation is capable of producing 10 tons of zinc (99%) per day. The sulphuric acid used in the electrolytic process will be made from Japanese sulphur, and the aluminium sheets used are imported from the United States. Works for the manufacture of calcium carbide at Electrona, 15 miles from Hobart, are stated to be complete. Foundations for coke ovens have been built at the same place for the manufacture of electrodes. Hitherto carbide has not been made in Australia, the imports, about 13,000 tons per annum, having been derived from Scandinavia, Germany, and Canada. The present capacity of the Electrona works is 5000 tons per annum, but it is to be increased. There is probably a bright future in store for electro-chemical and electro-metallurgical industries in Tasmania, as large blocks of power are available and the necessary raw materials are found within the State. Various projects for development in the other States have been put forward.—(*Bd. of Trade J., June* 13, 1918.)

SOUTH AFRICA.

Industrial Developments. — *Cape Town.* — Approval has been granted by the Cape Town City Council for the erection of factories for manufacturing glue, starch, glucose, and dextrine; margarine; and for fat reduction and fertiliser mixing.

Natal.—A firm in Durban has two specifications in hand for plant for the manufacture of caustic soda and bleaching powder.

Up to the end of February the production of Natalite amounted to 10,000 gallons, all of which was sold at 2*s*. 6*d*. per gallon in large drums of 90 gallons each, and 3*s*. per gallon in petrol cases. The company had on hand, about the same time, some 30,000 gallons of spirit manufactured, but, owing to the scarcity of denaturants, such as wood naphtha, it was not possible to proceed further with the manufacture.

The glass bottle factory which was started in Durban about eighteen months ago has quite outgrown both plant and premises, and an effort is now being made to extend its scope by forming a company with a capital of £30,000. The prospectus states that the machinery is awaiting shipment, and that the orders on hand, and promised, would occupy the whole of the plant for a year. Orders for bottles and other containers have come in from all parts of the Union, and there is every indication that a large number of small industries would quickly spring up if they could be assured of a plentiful supply of bottles.

There are now two factories at work in the Durban district making wattle extract. The value of extract exported from the Union during the year 1917 was £49,520, as against £14,930 in 1916.

Transvaal.—Anthracite coal is being treated in Mond producers at Vryheid for the production of ammonium sulphate, the present output of which is over 250 tons per month. It is proposed to take steps to utilise the surplus gas as soon as conditions permit of the importation of the necessary

plant. The same company is making sulphuric acid from pyrites obtained from the Rand. The plant, however, is not yet working up to its capacity of 400 tons per month.

The promising start made by the carbide factory on the Witwatersrand has, so far, proved disappointing, owing, it is said, to lack of sufficient capital. In 1913 South Africa imported 4285 tons of carbide and Southern Rhodesia about 200 tons.

Pretoria.—The blast furnace now in course of erection is expected to be in working order by July. The soap manufacturing industry is making satisfactory headway, and building additions have been found necessary to cope with increased business. The manufacture of white lead is about to be undertaken locally.—(*S. Afr. J. Ind., April,* 1918.)

GENERAL.

The Institute of Metals.—In view of the ever-growing importance of the art of metallurgy and of the scientific principles which form the necessary conditions of its successful practice, the activities of a progressive society like the Institute of Metals are well worthy of the attention of chemists. There are but few arts or industries into which metallurgy does not enter, directly or indirectly, and a society which aims primarily at establishing an *entente* between science and practice should not lack the support either of the investigator or of the manufacturer and user. Although the membership of the Institute has grown very rapidly, from 250 in 1908 to over 1000 in 1918, it is felt that there is still ample scope for a much larger representation of the great group of industries and professions with which it is concerned. With the object, therefore, of recruiting more members, and of increasing its sphere of usefulness, the Institute has recently published an illustrated " Membership Booklet ' C ' " containing an account of its manifold activities, a number of letters from many leading authorities in the world of metals, and a series of excellent portraits of its presidents. The booklet may be obtained on application to the secretary at 36, Victoria Street, Westminster, S.W. 1.

Indian Indigo.—In a letter to the *Times* of July 6, Prof. H. E. Armstrong draws attention to the prospects of revival of the natural indigo industry in India. One of the chief requisites is the marketing of a paste with a definite percentage of indigotin, comparable with that put on the market by the Germans. Mr. W. A. Davis, Indigo Research Chemist to the Government of India, succeeded in producing such a paste, but owing to the difficulty of obtaining casks and of high freights its commercial exploitation was not possible. What is now required is the production of the dye in a dry form, and already considerable progress has been made in this direction. A committee in this country, representing the Indian farmers, has succeeded in marketing a paste of natural indigo with a guaranteed strength, at a price approximating to that of the synthetic product. The reduction to paste is carried out here and has been found to be far less troublesome than had been anticipated. Indigo dyers all over the country have tested the product, of which considerable quantities are now on offer, and are agreed that, although it cannot be used for light shades owing to the presence of impurities, it is superior to the synthetic product for heavy shades. In one case, 5½ parts of the natural paste were found to give an intensity of colour equal to that produced by 8 parts of synthetic indigotin.

Although improvements in manufacture are important, it is probable that the recovery of the Indian industry will depend far more on agricultural developments, for which an adequate supply of phosphatic fertilisers is most necessary. Trustworthy estimates seem to show that, given proper yields, indigo can be made and sold at prices at which the competition of synthetic indigotin need no longer be feared.

The Natural Indigo Industry.—With the cutting-off of the supplies of synthetic indigo from Germany since the outbreak of war, the cultivation of natural indigo has increased considerably. While the total area under this crop in 1914-15 was only 148,400 acres, in 1915-16 it rose to 353,100, and in 1916-17 to 756,400 acres.

The greatest increase, both relative and absolute, occurred in the Madras Presidency and in the United Provinces, where the industry is mainly in the hands of small holders, and the dye manufactured is of an inferior quality. In Bihar, where a superior type of dye is manufactured, mainly in large factories, the increase of area in 1916-17 was about 33 per cent. as compared with 1915-16. The yield of indigo increased from 55,100 cwt. in 1915-16 to 95,500 cwt. in 1916-17, Madras contributing two-thirds of the total production. Both the acreage and output in 1916-17 were, however, only half of what they were in 1895, when the synthetic indigo came into the market. The forecast for 1917-18 puts the acreage at 690,600 and the output at 87,800 cwt.

The future of the indigo industry depends on the provision of a good and sufficient amount of seed; on an increase in the output of green leaf per acre; on improvement in manufacture; on organisation in marketing; and on the elimination of the practice of adulteration.

The problem of seed supply for Bihar has continued to receive the attention of the Botanical Section at Pusa. The authorities have come to the conclusion that the type of plant selected must be a rapidly-growing, early-flowering, bushy form, with a large proportion of the lateral roots comparatively near the surface, because experience has shown that this type of plant successfully withstands the monsoon in Bihar.

In Madras the question centres in the replacing of the Sumatrana plant by the Java variety. A small quantity of seed of the latter variety was obtained by the local Agricultural Department in 1916 and is being tried on Departmental farms. If the Java variety can be successfully grown in Madras it will not only give an increased yield, but also form a source of seed supply for Bihar. (See also this J., 1918, 155 R.)—(*Bd. of Trade J., June* 20, 1918.)

China's Richest Iron Mine.—The *North China Daily News* learns that an agreement has been practically concluded with the Japanese Government under which the immensely valuable iron mine of Feng Huang Shan, near Nanking, will be worked by the Chinese Government, and steel will be manufactured by Chinese and Japanese, the latter providing 20,000,000 yen to carry out the work. The journal points out that this virtually means that the Japanese will acquire control of the total output of the mine. At present they are pressing for the right to take part in working the mine, and pending a decision on this point the final signature of the agreement is temporarily delayed. The Chinese have always steadily refused to part with this mine, and although the Japanese have long been anxious to obtain it, the journal adds that the agreement has only been made possible by a resolution of the Chinese Cabinet transferring the control of the mine from the Ministry of Agriculture and Commerce to the Ministry of War. The Feng Huang Shan Mine is the largest single deposit of ore in China. It is estimated to contain 50,000,000 tons of available ore.—(*Liverpool Daily Post, June* 25, 1918.)

SULPHITE SPIRIT FACTORY IN NORWAY.—The Union Company's new spirit factory has, it is reported from Skien, now commenced operations, all initial difficulties having been surmounted. The factory will now work regularly, and it will be possible to produce between 2000 and 3000 litres of spirit per 24 hours.—(*Anglo-Norweg. Tr. J., June,* 1918.)

AMALGAMATION OF NORWEGIAN YEAST FACTORIES.—An important amalgamation embracing the eight factories engaged in yeast production in Norway will become effective on July 1. The new company —to be called the Norwegian Yeast and Spirit Factories A/S—will command a capital of 2,500,000 kroner (£145,000 approx.), and have its offices in Christiania.—(*Anglo-Norweg. Tr. J., June,* 1918.)

NEW MOLYBDENUM DEPOSIT IN NORWAY.—A new deposit of molybdenite has been discovered at Lier, Norway, less than 50 miles from Christiania. The ore-bearing quartz veins have a breadth of only 2 inches, but the percentage of metal is high. The deposit has been bought up by a group of Christiania business men.—*U.S. Com. Rep., April* 23, 1918.)

MANUFACTURE OF FERRO-ALLOYS IN SWEDEN.—More than 150 electric furnaces, consuming about 160,000 kilowatts, have been erected in Sweden during the last ten years, principally for the manufacture of ferro-alloys. Swedish molybdenite is of too poor a grade to be employed directly in the manufacture of ferro-molybdenum, but the problem of concentration of the ore has been solved satisfactorily.. Working on Norwegian concentrates, a company at Arboga produced 466 kilo. in 1916, and 636 kilo. in 1917, and another firm at Tröllhattan turned out 16,000 kilo. in 1916.—Ores suitable for making ferro-manganese are found at Spexeryd, Langbanshyttan, and Dalsland. The production of this alloy in Sweden in the years 1914 to 1917 was 300, 900, 500, and 1100 tons respectively.—Many Swedish iron ores contain vanadium, but not in utilisable quantities; the problem of extraction is still under investigation. The necessary raw material, hitherto imported from Germany, has been found quite recently in the ash of coal from mines at Bellinger. The sole manufacturers of this alloy in Sweden, a Tröllhattan company, produced 1500 kilo. in 1914, and 3800 kilo. in 1915.—The commercial production of ferro-alumino-silicon was started by another Tröllhattan company in August, 1914. The annual production has risen from 64 tons in that year to 1000 tons in 1917. Most of the output has been exported. The same company began the manufacture of ferro-alumino-mangano-silicon in 1915. The quantities of this alloy produced in Sweden from 1914 to 1917 were 422, 785, 733, and 1329 tons respectively, and the greater part of the output has been sent abroad.—(*Board of Trade J., June* 13, 1918.)

INDUSTRIAL DEVELOPMENTS IN GERMANY.—The *Neue Zürcher Zeitung* has recently published a review of German activity in manufacturing processes.

Important researches on the properties of coal have been made by the *K.W. Institut für Kohlenforschung.* Coal treated at ordinary temperatures with sulphuric acid yields 5 per cent. of its weight of a viscous mineral oil of a yellow colour. A process has also been studied for treating coal hot with naphthalene under pressure in the presence of chloride of aluminium in order to obtain an oil that can be used for lighting or power purposes. Lastly, by treating the coal with ozone it has been possible to transform its components into materials soluble in water, but up to the present the chemical importance of this fact cannot be judged.

The use of lignite has been greatly developed, particularly in the neighbourhood of Bitterfeld and Halle a. d. Saale, in the factories producing nitric acid from the air. A process has also been discovered that enables more than double the quantity of paraffin to be obtained from lignite than by the present methods.

A new process for obtaining nitrates from the atmosphere has been developed that works at four times the air velocity, and gives a result about 80 per cent. greater than the older methods.

Considerable progress has been made in the manufacture of metals that can replace copper, brass, and bronze, and special mention should be made of various alloys of zinc and lead. In metallurgy it has been found possible to operate with copper schist of 0·7 per cent., whereas the poorest grade hitherto workable has been 2·5 per cent. Considerable success has attended the efforts to extract aluminium from clay. The lowest limit of nickel ore that can be treated has been reduced from 2·5 to 1·5 per cent., and a process has been developed for extracting metal and cobalt from outflow water containing these materials.—(*Industrie Electrique, March* 10, 1918.)

LUBRICATING OIL FROM HEMP-SEED.—Oil of a quality suitable for aeroplane motors is being obtained in Russia largely from hemp-seed. The presses produce a yield of from 5 per cent. to 6 per cent. of a dark-grey coloured oil. Refining and filtering processes give, as a pure lubricating product, 30 per cent. of a clear yellow oil. The coarse residue is used for soap-making. As the manufacture has been carried on mainly by Austrian prisoners of war, the processes will soon become known in Austria-Hungary and Germany. An important point in this connexion is the great increase in the cultivation of hemp in Germany, where, consequently, large quantities of seed are already available. — (*Prometheus, March* 23, 1918.)

PAPER-WOVEN GOODS.—Great progress has been made in the last six months in the manufacture of paper-yarn and paper-woven goods. There is now hardly any branch of the German textile industry wherein paper is not used as a substitute for other fibrous materials. Paper yarns up to No. 25 and beyond are now being spun. Some two million kilograms of paper specially prepared for spinning is manufactured daily in Germany. Prejudice, strong at first against paper-woven goods on the ground of lack of durability, is fast disappearing in the face of experience, since improvements in the manufacture of paper, due largely to competition, have given the durability required. This substitute for cotton, flax, and wool has not only bridged over a difficult time, but has come to stay. —(*Z. angew. Chem., April* 16, 1918.)

COINAGE METALS IN WAR-TIME.—The coinage metals in Germany comprise gold, silver, nickel, tin, copper, and zinc. New silver coins are issued without removing annealing tarnish in order to prevent hoarding; the fineness remains at 900 per 1000. The 5- and 10-pfennig pieces, which before the war were made of 25 per cent. nickel and 75 per cent. copper, are now made of galvanised steel. The material used is a dead mild Siemens steel with yield point 1730 kilo. per sq. cm. and maximum stress of 3290, with an elongation of about 33·6 per cent. It must be free from segregation and from sulphide and slag inclusions, and when in the form of blanks must show no brittleness under a bending test. The covering of pieces of wood, cardboard, etc., with a layer of zinc by the Schoop process is recommended for prison camps, etc. The galvanising of the ordinary coins is carried out

satisfactorily by sherardising. The thickness of the deposit can be determined by utilising the fact that iron is very sparingly soluble in dilute sulphuric acid containing arsenic acid, whilst zinc is readily soluble. If the deposit of zinc be too thick, the coin is rendered brittle. Similar galvanised iron coins are in use in Poland and Austria. These coins placed in distilled water for six hours show local rust spots, which follow the direction of rolling. The 1-pfennig pieces are now made of aluminium. Zinc has been used for small coins in Belgium, Germany, and Bulgaria; but, in general, there is no doubt that iron is the most satisfactory metal to use for coinage in war time.—(*Metall u. Erz, Mar.* 8, 1918.)

New Mining Enterprises in Bulgaria.—The exploitation of the mineral wealth of Bulgaria has already begun, as a consequence of the German alliance. Two strong mining companies have been formed; one to work the coal-beds in the neighbourhood of the villages of Kutina and Kurillo, in the district of Sofia, the erection of works for the manufacture of briquettes, and the supply of electric power; the other for prospecting purposes, the sale of mine produce, and the promotion of mining enterprise generally.—(*Metall u. Erz, Feb.* 22, 1918.)

Water Power on the Upper Rhine.—A great scheme for the utilisation of the water power available on the Upper Rhine is now in course of realisation. It consists in canalising the Rhine between Strassburg and Bâle, with a view to use the water power to generate electric current—*i.e.,* to establish a great electric power station. On account of complications of ownership and local authority, the Government has taken the work in hand. A lively interest in the scheme has been excited in Switzerland, for an extension of the water carriage to Bâle offers advantages of no small importance.—(*Z. angew. Chem., April* 16, 1918.)

Discovery of a New Radio-active Element.—The *Münchner Neueste Nachrichten* reports that the parent substance of actinium, and in it (?) a new radio-active element of great emissive power, have been discovered. The former, which has been called protactinium, was isolated from pitchblende residues (insoluble in nitre and acids) after removing all the constituents except those of the tantalum group, the yield being 73 mgm. from 1 kilo. of residue. It was isolated as a white powder with a half-period of decay of 1200—18,000 years.—(*Bd. of Trade J., June* 20, 1918.)

Asphodel as a Source of Alcohol.—*Asphodelus ramosus,* which contains much starch in its tubers, grows as a common weed (porrazzo) in many parts of Italy; in fact, it has been called " the plague of the Mediterranean." At one time it was cultivated as a source of industrial spirit, but, owing to difficulties in the rectification, the culture was abandoned. If these difficulties could be overcome Italy would be able to considerably increase her home supply of spirit, for it is claimed that every acre of asphodel plants yields 17,850 lb. of roots from which not less than 107 gallons of alcohol could be obtained. When the manufacture of porrazzo was carried out in Algiers the residue from the distillation was used successfully in the production of paper, but it could also be used directly as a cattle food.—(*Annal. d'Ingegn. e d'Archit., April,* 1918.)

Discovery of Manganese in Brazil.—Important deposits of manganese have just been discovered in the State of Minas Geraes in the Commune of Lavras, near the station Carrancas, on the Minas Western Railway. The ore is of superior grade, and could easily be transported to Rio de Janeiro or Santos, for shipment to Europe.—(*So. Amer. J., June* 29, 1918.)

Organisation of Chemists in Japan.—Questions of organisation are agitating the minds of chemists, not only in England, but also in far-away Japan. Formerly the Japanese chemist was placed well below other professional men, and even below the farmer, but the war has set Japan on so firm an industrial basis that now he is coming into his own. An organisation is foreshadowed which will include engineers, chemists, mining experts, etc., and which will work for the promotion of the social status of these professions as well as for improved material rewards.—(*The Chem. Technol., March,* 1918.)

Fuming Sulphuric Acid in Japan.—The demand for fuming sulphuric acid in Japan has greatly increased during the war, and the only source until recently has been the Government Arsenal, which has released its very limited surplus of acid at 4½*d.* per kilo. The quantity set free was quite insufficient to meet the demand, and new plants were erected by various firms to increase the supply. The Dai-nippon Artificial Manure Company decomposes nitre cake at a temperature exceeding 700° C., and collects the free sulphur trioxide in a condenser. A clear light-brown product is thus obtained, but the process is uneconomical, and the acid is sold at about 9*d.* per kilo. The Tokyo Sulphuric Acid Company has installed a Tenterlew plant and placed a Russian expert in charge, while the Nippon Seimo Seizo Company, one of the oldest established alkali works in Japan, is about to work one of its own patented processes, with an initial rate of output of 6 tons per day.—(*The Chem. Technol., March,* 1918.)

Japanese Coal Supplies.—The already proved coal fields of Japan contain, at a moderate estimate, 2,000,000,000 tons, mostly of a bituminous quality which will make very good coke. Before the war an annual output of more than 15,000,000 tons had been attained, at a pit-mouth price of less than 10*s.* a ton. Nearly all the cutting is done by hand, but machinery is being introduced as rapidly as circumstances permit. Even with hand-working the output of the Japanese coal mines, per man employed, is just about equal to that of this country, *viz.,* 250 tons a year. There is every prospect of a rapidly increasing production, ample to meet the needs of Japanese industry and to allow of substantial exports to various coaling stations in the Pacific and Indian Ocean.—(*Engineering, June* 14, 1918.)

Austrian Coal Production.—A Vienna daily paper reports that the Hungarian Government Coal Commissioner has instructed all agricultural associations, Chambers of Commerce, communes, landowners, and owners of peat deposits to turn to account the peat in their possession in order to save coal.

According to the same paper, the output of coal in Austria has fallen off during the first quarter of 1918, and only amounted to 3,810,000 metric tons, which is 480,000 tons less than in the corresponding period of 1917. The output of coke has fallen from 664,000 to 575,000 tons; briquettes from 36,651 to 28,146 tons; lignite from 5,297,000 to 5,231,000 tons. —(*Iron and Coal Tr. Rev., May* 31, 1918.)

Oil Fuel in India.—As a result of trials with oil fuel which have been carried out on the Karachi district of the North-Western Railway of India, it has been decided to convert all the 250 engines serving this district from coal to oil burning. The oil consumption on the district will then average about 5000 tons per month, in place of an average of 9000 tons of coal now consumed.—(*Coll. Guard., June* 14, 1918.)

New Source of Coal near Lyons.—The prospecting for coal which has been actively carried on since 1914 to the east of Lyons has resulted in the discovery of a rich deposit of coal, more extensive, in all probability, than that of the St. Etienne field, of which it is an extension. The seam was discovered at Toreien (Ain), and is about 2000 ft. from the surface.—(*Iron and Coal Tr. Rev., June* 7, 1918.)

Coal in Peru.—The Government of Peru is taking steps to develop the coal lands of the country, and has recently contracted a loan of £300,000 for the extension of the Central Railway of Peru from its present southern terminus at Huancayo to the coal field of Jatunhasi on the eastern side of the Andes. The mines are 11,000—15,000 ft. above sea level, and it is calculated that there is 50 million tons in sight going down 2000 ft. The coal is of firm quality averaging 12 per cent. of ash and cokes very well, but analyses do not indicate a high grade fuel coal.—(*Coll. Guard., June* 7, 1918.)

Potash Production in the U.S.A.—The output of all potash materials produced and marketed in the United States in 1917 was 126,577 short tons, which contained an average of 26·4 per cent. of pure potash (K_2O). This is more than three times the quantity produced in 1916.

Potash produced in the United States in 1917.

Sources.	No. of producers.	Total production, short tons.	Available potash (K_2O), shor tons.	Value at point of shipment, $
Mineral sources:				
Natural brines ...	10	79,876	20,652	8,219,912
Alunite (refined salts and crude and roasted alunite)	3	7,153	2,402	892,763
Dust from cement mills	8	13,582	1,621	700,523
Dust from blast furnaces	3	2,133	185	68.841
Organic sources;				
Kelp	10	11,806	3,572	2,114,815
Molasses residuo from distilleries	4	8,589	2,846	1,130,907
Wood ashes ...	36	700	424	406,856
Evaporated "Steffens water" from sugar refineries	5	2,593(a)	359	143,430
Evaporated wool washings and miscellaneous industrial wastes	3	645	305	113,875
	82	126,577	32,366	13,791,922

(a) Includes 1333 tons of material produced but not sold in 1917.

Brines.—The output of one of the four plants producing potash from brines in Western Nebraska considerably exceeded that from any other one source or district, and the combined output of these plants represents about 45 per cent. of the total for the entire country. Searles Lake, Cal., had also a large production.

Kelp and Alunite.—The potash produced from kelp represents about 10 per cent. of the total. A large part of this was high-grade potassium chloride produced by two companies, and the rest was divided among eight other producers, which manufactured kelp char or ash, used as an ingredient of fertiliser, and containing 16—36 per cent. of potash. An unexpected shortage of the kelp crop curtailed the production from this source in 1917.

The production from alunite was not so great as had been expected, though two additional producers entered the field during the year. The plant of the original producer was destroyed by fire in October, and it had not been put into operation again by the end of the year. In addition to the high-grade potassium sulphate produced from alunite, a considerable quantity of calcined alunite, carrying 16 per cent. of available potash, was marketed for incorporation into fertilisers, and raw alunite was shipped to Eastern reduction works to be treated for the recovery of potash.

Sugar Residues.—A fairly high-grade potash is produced from the residue of charred molasses at alcohol distilleries. Like kelp char, it is used in fertiliser mixtures.

Cement and Blast-furnace Dusts.—Eight cement mills reported production of potash salts or of potash-rich dusts sold as fertiliser during the year, the quantity marketed from this source reaching a total of 13,582 short tons, representing 1621 tons of actual potash (K_2O). The recovery of potash from cement dust is being rapidly extended, and seems to offer great promise. It is expected that the production from this source may take second place in the summary by sources for 1918.

The dust collected from blast-furnaces is a significant, though still a minor, item in the total for 1917. The production of potash from this source may eventually be large, but in view of the stress under which the steel plants are now operating this process may receive but little attention during the war.

Crude potash is still produced by leaching wood ashes, chiefly from Wisconsin and Michigan. Many of the producers keep no exact records of their operations, and do not always know the quality of their product, so that exact interpretation of the figures they furnish is impossible. Reports from thirty-six producers in 1917 show a gross output marketed of 700 short tons, having a value of $406,856. This is assumed to represent about 424 short tons of K_2O.

Refined potash salts were produced from wool washings in 1917 by at least two plants, and some potash was produced from the ash or char obtained by burning other waste organic matter at several industrial establishments.

Potash was produced in 1917 by 82 firms, including 36 wood-ash leachers, most of them operating small works. The total production is about 13 per cent. of the normal consumption of potash in the country during the years immediately preceding the war.—(*U.S. Geol. Surv. Press Bullet., May*, 1918.)

The Sugar Industry in Brazil.—H.M. Commercial Attaché in Rio de Janeiro reports that there are 33 sugar factories operating in Campos, of which the estimated capital is 35,250,000 milreis, while the average annual production of sugar is valued at 21,000,000 milreis. The estimated area devoted to sugar cultivation is 39,190 hectares, while the estimated production of cane is 1,055,000 tons. This amount of cane is not sufficient for the Campos mills, which work day and night, and some 50,000 tons a year are received from Carangola. It should be noted that the land owned by the sugar usinas is not entirely devoted to sugar cultivation, a proportion being devoted to cattle raising and agricultural produce.

In addition to 11,688,000 litres of aguardente and 2,112,000 litres of alcohol, the amount of sugar produced at the 33 factories was 54,000,000 kilo. in 1915, as compared with 72,120,000 kilo. in 1914; production, however, tends to increase. Of the 33 factories 5 (producing 14,220,000 kilo. of sugar) do not distil aguardente, and only 6 of the factories distil alcohol, so that many by-products were lost, and to avoid this a distillery has now been erected. The sugar is brought either direct to the factories on eight-team bullock waggons or loaded on to railway trucks on numerous branch lines.

The supply of fuel is a problem. All the fuel used is wood from the surrounding woods and

forests. In 1914 the 33 usinas consumed 190,000 cubic metres of wood, amounting in value to 835,000 milreis (£42,750).

In three factories visited the various machinery included both French and German. The original machinery was erected by Scottish engineers.—(*Bd. of Trade J., June* 6, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Workmen's Compensation (Silicosis) Bill.

This Bill was introduced by the Under-Secretary of State for the Home Department and read a second time. It provides compensation for workmen suffering from a lung disease (fibroid phthisis) developed in such occupations as ganister mining and silica brickmaking; and it also provides for the suspension from employment of workmen who may have the disease in an initial stage. The House was asked to treat the Bill as a war measure, because owing to war work the disease has reached an acute stage in a number of individual cases. It is proposed that claims should be settled by a joint committee representative of employers and workmen, with an independent chairman. (June 21.)

Opium.

In a written answer to Sir W. Collins, Mr. A. Balfour stated that H.M. Government has received official information tnat an agreement has been concluded between the Chinese Government and the Opium Combine for the purchase of the stocks of Indian opium in bond at Shanghai and Canton, but no official information is at hand regarding the sale of the stocks to a syndicate. (June 20.)

Zinc.

In reply to Mr. Holt, the President of the Board of Trade intimated that no agreement or contract has been made between the Government and the Zinc Corporation in relation to the smelting of zinc concentrates in this country. (June 24.) (*v.* page 270 R.)

Oil Production (Great Britain).

Answering General Croft, Mr. F. C. Kellaway announced that the Ministry of Munitions is taking every possible step to increase the production of oil from coal and shale deposits in the country, and of creosote. The work is hampered by the shortage of labour, but very considerable progress has been made. (June 24.)

Carbide.

In answer to a question put by Sir J. Barran in connexion with the shortage of carbide and the great difficulties experienced by users of acetylene for lighting, and the possibility of the release of stocks, Mr. Kellaway said that the position of carbide supplies has recently improved, and he is considering the possibility of releasing a limited quantity for purposes which have not hitherto been permissible. (June 24.)

Replying to Mr. A. Allen, Mr. Kellaway announced that arrangements are being made to release a limited quantity of carbide each month, as supplies permit. This will be available for house lighting and will be obtainable next week. (July 4.)

Business Names.

The President of the Board of Trade, in answer to Mr. Billing, stated that proceedings were instituted by the Board of Trade against Messrs. Fuerst Brothers, Ltd., for failure to make proper disclosure under the Companies (Particulars as to Directors) Act, and each of the directors was fined. The company has supplied Government Departments with chemicals. All the directors are British subjects, two of them, who were naturalised in 1882 and 1884 respectively, being of German birth. One of the directors changed his name from Fuerst to Forster in February, 1917. (July 1.)

Indian Exports (Adulteration).

The Secretary of State for India, replying to Colonel Yate, said that the Government of India is now consulting with the chambers of commerce in India, with a view to taking measures to prevent the adulteration of Indian products, including cotton. Similar inquiries are being made by the Indian Trade Commission in London. Hitherto the Government view has been that the evil could not be effectively dealt with by legislation, and, while keeping an open mind on the subject, it considers that the remedy lies in the hands of the trade itself, either by arrangement between exporters and buyers that the latter should insist on freedom from adulteration, or by the establishment, under the control of chambers of commerce, of some system under which the purity of products would be certified before export. (July 1.) (See this J., 1918, 81 R.)

Chinese Iron-Mine Concession.

With reference to a question put by Sir C. Hobhouse concerning the valuable Feng Huang Shan Iron Mine near Nanking, Lord R. Cecil said that negotiations were proceeding for its acquisition by a Japanese syndicate, but there is no official information that the negotiations have been concluded. The mine is situated in the Yangtse River area, which H.M. Government has always regarded as its special sphere of interest in China, but it is of opinion that neither British nor any other foreign claims to spheres of interest in China should be pressed so far as to be inconsistent with the principle of the "open door." Neither the British Ambassador nor the Foreign Office was consulted before the concession was asked for. (July 2.) (*v.* page 261 R.)

Glycerin.

Replying to Mr. Molteno, Mr. Kellaway stated that glycerin is released for medicinal purposes where it is indispensable, competent medical advice being taken in doubtful cases. (July 2.)

Analytical Chemist (Calling-up Notice).

Mr. Snowden asked the Minister of National Service if he had received a letter from the solicitors of a young student at Liverpool, who was about to sit for an examination lasting several days, but whom the National Service representative had ordered to join the Army at once, in spite of the fact that the local tribunal thought he should be allowed to sit. Mr. Beck said the letter was sent to the Director of National Service of the North-Western Region; he would inquire as to the action which may have been taken by him. (July 3.)

Salvarsan Substitutes.

Mr. Hayes Fisher informed Mr. Snowden that the payments made by local authorities to manufacturers for supplies of salvarsan substitutes are at the minimum rates prescribed by the licences issued by the Board of Trade, and are at the same rates as those charged to Government Departments for supplies of these preparations. The payments are made in the first instance from the funds of the local authorities, but 75 per cent. of their expenditure for this purpose is replaced by the Local Government Board. (July 4.)

LEGAL INTELLIGENCE.

VEGETABLE OIL SOAP CONTRACT. *M. J. Regan* v. *Oakley, Sollas and Co., Ltd.*

A dispute relating to the sale of vegetable oil soap came before Mr. Justice Sankey on June 5 in the King's Bench Division in the case of M. J. Regan, of St. Swithin's Lane, against Messrs. Oakley, Sollas and Co., Ltd., of Gracechurch Street, E.C. The matter came before the Court on the award of an arbitrator in the form of a special case.

Mr. Matthew asked on behalf of the respondents that the award might be remitted to the arbitrator in order that the facts might be more clearly found. Messrs. Oakley, Sollas and Co. were said to be the sellers to Mr. Regan of 300 tons of vegetable oil soap at £42 10*s*. per ton, the contract for which had been signed on their behalf by Mr. H. Tyssen, one of their managers. The main point in the case was whether Mr. Tyssen had authority to sign or not. The claimant asked for damages against the respondents for breaches of the contract, *viz.*, non-delivery of, and refusal to deliver the goods thereunder. The contention of the respondents was that the contract, dated October 17, 1917, was not binding upon them on the ground that it had been signed without their authority, and that the contract had been broken by claimant in that he had not paid cash on delivery for certain goods. On August 17, 1917, respondents wrote Mr. Regan notifying him that no contracts for chemicals would be recognised by them unless they bore the signature of certain named directors. Notwithstanding this notice it was proved that other contracts for chemicals were signed on behalf of the respondents solely by Mr. Tyssen, and not by the directors mentioned, and that on this ground, and also from other evidence adduced, the arbitrator found that the respondents were prevented from alleging that Tyssen had no ostensible authority to enter into the contract in question. It was also found that the 5 tons of goods as per delivery order sent by respondents to Mr. Regan on October 18, and for which the latter refused to pay, did not comply with the contract as to quality and description, and that no delivery or tender of goods was made in accordance with the contract. It was further found by the arbitrator that if the contract was binding upon the respondents they had committed breaches, and the loss which Mr. Regan was entitled to from respondents was £2 per ton, or £600.

His Lordship said the point was whether the arbitrator had insufficiently stated the case. He was of the opinion that he had not. His Lordship was unable to see what more the arbitrator could do if the case was remitted to him. He considered he had stated neatly and accurately the facts that he had found. There was in his opinion no ground for remitting the award to the arbitrator. The motion to remit accordingly failed, and would be dismissed with costs.

SPLITTING OF PALM KERNEL OIL. *Olympia Oil and Cake Co.* v. *Macandrew, Moreland and Co., Ltd.*

In the King's Bench Divisional Court on June 20, Justices Shearman and Sankey heard a motion to set aside the award of the arbitrators in an arbitration between the Olympia Oil and Cake Co., of Selby, Yorks, and Messrs. Macandrew, Moreland and Co., Ltd., of Liverpool, arising out of contracts by which the Olympia Co. were the sellers last August of two lots of 100 tons each of palm kernel Twitchell fatty acids at £73 10*s*. per ton for delivery in October, 1917. Messrs. F. A. Greer and Greaves Lord appeared for the sellers, and Messrs. W. C. Leck and C. R. Dunlop for the buyers.

Mr. Greer said the sellers asked the Court to set aside an award adverse to them on legal grounds—the alleged refusal to state the award in the recognised form, an excess of jurisdiction, and a refusal to admit certain evidence. The sellers were sued for non-delivery. They based their defence on Section 3 of the Courts Emergency Powers Act, 1917, contending that failure to deliver followed on their compliance with a direction or advice by a Government Department in the national interest in connexion with the war. To obtain the fatty acids the palm kernel oil had to be chemically treated with a reagent to split it into fatty acids and glycerin. The Food Controller, wishing to preserve the oil in its complete state for use in the making of margarine, had made an order in November last prohibiting the splitting of edible oils, including palm kernel oil. The sellers contended that before that order was made they received an advice from a Government Department asking them not to split up the edible oils. It was this latter point that the sellers wished to lay before the arbitrators. They wished to have an opportunity of bringing forward Mr. Watson, the Chairman of the Olympia Co., to give evidence to that effect. The arbitrators would not agree to admit a letter from the Government Department saying that such an advice had been sent. The arbitrators refused an application at that stage for a further adjournment, and for a case to be stated as to whether the Courts Emergency Powers Act applied. The arbitrators made an award, however, against the sellers who had not been given an opportunity of calling Mr. Watson to prove the facts on which they relied. They appealed unsuccessfully against the award (that they should pay £1800 in full settlement) to the Appeal Committee of the Liverpool General Brokers' Association, and they now came to this Court to have the award set aside.

Mr. Leck was not asked to reply.

Their Lordships dismissed the motion with costs.

Mr. Justice Sankey in giving judgment said that there had been two adjournments of the arbitration proceedings to give the sellers an opportunity of producing a certificate under Section 3 of the Courts Emergency Powers Act as to the request to stop splitting edible oils, and after neither of those adjournments were the sellers able to produce the certificate. Further, there was nothing to show that Mr. Watson could in any way prove that there was such a direction or advice. He held that the arbitrators were innocent of any legal misconduct; there had been no excess of jurisdiction, the arbitrators being entitled to make the award in the form they did; and the award was not bad on the face of it.

EXTENSION OF TERM OF "THERMOS" FLASK PATENT.

In the Chancery Division on June 21 Mr. Justice Sargant gave judgment in the petition of Sir James Dewar for an extension of his letters patent No. 13,638 of 1904, for "an improved method of absorbing gases, and the application thereof to the production of high vacua and the separation of gases." The patent related to the method of making high vacua in the "Dewar" or "Thermos" flask by utilising the great absorbent power of charcoal for gases at very low temperatures.

The petition, which was heard on June 4 and 5 last, was opposed by the Liquid Air and Rescue Syndicate, Ltd., which acted as agents for the Maschinen- und Apparate-Fabrik A. K. Ahrendt, of Berlin. In 1913 the latter firm negotiated with Sir J. Dewar for the use of his invention and had paid him £1000 on account of £3000 up to the outbreak of war; and of the £1000 the English syndicate claimed to have paid £333 for the use of the English, American, and Canadian rights. The petitioner claimed that the agreement was dissolved by reason of the outbreak of war.

In giving judgment, Mr. Justice Sargant said that there was no foundation for the suggestion of want of novelty put forward by the Crown; the petitioner was entitled to full credit for the invention and for the discovery on which the invention was based. A very high degree of merit was attached to the invention. Professor Armstrong called it "a pioneer fundamental invention" . . . "a new departure"; and Professor Pope spoke of it as "a tremendous achievement," and said "it provided us with a new tool which immediately led to very great extensions of our knowledge."

The petitioner had been deprived of any adequate return from his invention because during the life of the patent opportunity for commercial exploitation had been lacking. So long as liquefied gas had to be produced and stored in small quantities only, glass containers could be used which sufficiently preserved the enveloping vacuum without the aid of the absorptive properties of charcoal at the low temperatures in question. It was only when liquid air begau to be produced and used in large quantities that metal containers became necessary, and that such a deterioration of the enveloping vacuum ensued as necessitated the employment of these absorptive powers of charcoal in accordance with the invention.

There was also great merit in the last three claims of the patent dealing with the discovery that the mixed gases contained in the absorbent charcoal are expelled, on raising the temperature, in different proportions from those in which they were absorbed. There was no want of novelty in this further invention, and the petitioner's failure to reap an adequate reward was due to the same cause as before.

The extension of the letters patent would be granted for a period of five years from the expiration of the original patent on terms providing that the petitioner "be bound to grant to any persons approved by him or by the Board of Trade, and as from the date of the commencement of the patent or any later date (and therefore possibly retrospectively) licences to use the invention to such extent, for such purposes, with such restrictions and on such terms generally as a duly qualified arbitrator appointed by the Board of Trade shall determine to be fair and reasonable. The opponents will of course be entitled to apply for such a licence in exactly the same manner and on the same footing as any other applicant. I decline to give them any preferential rights either as to being relieved of obtaining the approval of the Board of Trade or as to setting off against royalties under any licence any part of the £1000 paid by the German manufacturers to the petitioner that is alleged to have been provided by the opponents. It has been held, and obviously quite rightly held, that the petitioner's bargain was with the German firm only, and that he is entirely unaffected by any sub-arrangement that the opponents may have made with that firm."

Appointment of Water Power Resources Committee.—With the concurrence of the Ministry of Reconstruction, the Board of Trade has appointed a committee to examine and report upon the water power resources of the United Kingdom and the extent to which they can be made available for industrial purposes. The committee consists of: Sir F. F. C. Snell (chairman), Mr. G. S. Albright, Sir Dugald Clerk, Dr. J. F. Crowley, Mr. H. F. Carlill, Mr. P. Dawson, Prof. Gibson, Mr. V. Hartshorn, Dr. H. R. Mill, Mr. A. Newlands, Mr. G. C. Vyle, Mr. A. J. Walters, Mr. R. Walter, Mr. D. J. Williams, with Mr. R. T. G. French as secretary (address 10 Princes Street, Westminster, S.W. 1).

GOVERNMENT ORDERS AND NOTICES.

THE PETROLEUM PRODUCTS (WHOLESALE PRICES) ORDER, 1918.

The Board of Trade has issued an Order, dated June 25, forbidding the sale by wholesale dealers of the following petroleum products except at certain fixed prices given in the Schedule of the Order: spirit, kerosene, white spirit, gas oil, and fuel oil.

[The full text of the Order is given in the *London Gazette* for June 28.]

THE LEAD (AMENDMENT) ORDER, 1918.

The Ministry of Munitions in an Order dated June 28 has fixed the prices for certain classes of lead as follows:—

	£	s.	d.
Sheet lead	41	0	0
Lead pipe	41	10	0
Dry white lead	51	0	0
White lead in oil	58	0	0
White lead in oil	60	0	0
Red lead aud litharge	45	0	0

GAS WORKS (MINISTRY OF MUNITIONS) ORDER, 1918.

All gas works in the United Kingdom excepting those which possess coal gas plants only and have no plant installed for scrubbing or washing their gas either with oil or with tar, must, on and from July 1, manufacture gas in accordance with the general regulations set out in the Schedule to the Order.

The Schedule.

1. Gas works which have coal gas plants only must work to produce gas of as nearly as possible 500 B.Th.U. gross calorific power.

2. Gas works which have both coal gas plants and water gas plants must produce gas of a calorific power as in 1 above, either by working the coal gas plaut alone, or by reducing coal gas of higher calorific power to the required calorific power by the addition of the requisite amount of uncarburetted water gas.

3. All gas works which have facilities for scrubbing their coal gas must scrub the gas produced to the fullest possible extent for the extraction of ammonia, toluol, and benzol.

4. If at any time it is impossible for any gas works, whilst complying with the above regulations, to supply the full demands of its consumers for gas, then

(*a*) If the gas works has a water gas plant the balance of the consumers' requirements shall be made by an admixture of uncarburetted water gas, but the calorific power must be maintained as high as possible with a minimum of 450 B.Th.U. gross. Should this be impossible without carburetting the water gas, the water gas shall be carburetted with gas oil.

(*b*) If the gas works has no water gas plant it must report the matter to the Ministry of Munitions and must comply with any instructions received therefrom.

5. Excepting only as provided in 4 (*a*) above, no gas works may in any circumstances use any gas oil for carburetting its water gas without written authority from the Ministry of Munitions.

All applications with regard to the above Order should be addressed to the Ministry of Munitions, Department of Explosives Supply, Storey's Gate, S.W. 1, aud marked "E.G.S."

[The full text of the Order is given in the *London Gazette* for June 28.]

Patents and Designs in South Africa.—An Order in Council, dated June 25, directs that the provisions of Section 91 of the Patents and Designs Act, 1907, so far as relates to patents and designs, shall apply to the Union of South Africa, as from and including July 1, 1918.

OTHER ORDERS.

Motor Spirit (Consolidation) and Gas Restriction Order, 1918. Amendment Order, Board of Trade, June 15.

Paper Restriction Order No. 2, 1918. Board of Trade, June 17.

Sale of Wool (Great Britain) Amendment Order, 1918. Army Council, June 17.

Flax Seed (Ireland) Order, 1918. Ministry of Munitions, June 18.

Metal Bands (Wool Bales) Order, 1918. Army Council, June 19.

Kips and Calf Skins (Ireland) Order, 1918. Army Council, June 20.

Coal (Pit's Mouth) Prices Order, 1918. Board of Trade, June 24.

The Household Fuel and Lighting Order, 1918. Board of Trade, June 28.

PROHIBITED EXPORTS.

Denmark and Holland.—In connexion with the grant of licences for the export of certain goods to Scandinavia and Holland (*Bd. of Trade J.*, Feb. 21 and May 16), a revised and enlarged schedule of articles has been issued by the Director of the War Trade Department, which will take effect as and from June 25 last, and is applicable to Denmark and Holland.

Norway.—The Director of the War Trade Department announces that he is now prepared to consider the issue of export licences for certain of the goods set out in Schedule "B" of the provisional notice which appeared in the *Board of Trade Journal* for May 16 last.

Switzerland.—A Proclamation, dated June 25, prohibits the export of various articles to Switzerland. The accompanying schedule includes—with a few exceptions—all the articles which have hitherto been required to be consigned to the S.S.S. and of which the exportation has already been prohibited. Among the exceptions are: Aniseed and star aniseed; barium nitrate and sulphate; lime, phenate of; liquorice juice and roots; marble; and zinc dust.

PROHIBITED IMPORTS.

Cocaine and Opium.—By the Cocaine and Opium (Prohibition of Import) No. 3 Proclamation, 1918 (June 25), the importation into the United Kingdom of all cocaine and opium is prohibited, except under licence.

The word "cocaine" includes ecgonine, and any substance, whether preparation, admixture, extract or otherwise, containing 0·1 per cent. or more of cocaine or ecgonine, or of any salt or derivative thereof.

The word "opium" means raw opium, powdered or granulated opium, or opium prepared for smoking, and includes any solid or semi-solid mixture containing opium.

The Cocaine and Opium (Prohibition of Import) No. 2 Proclamation, 1916, is revoked.

REPORT.

ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

The Report for the year ended May 31, 1918, not only furnishes abundant evidence of the important work which the Association has undertaken, but also bears witness to "things accomplished and things done" in more than one useful direction. As already notified in these columns, the Association has been officially recognised as representative of the industry as a whole. Its membership now comprises a total of 130 firms, representing an aggregate capital of £50,000,000, and the Fertilisers Manufacturers' Association has recently been affiliated.

The success of the efforts made to allow of the use of pure methyl alcohol, undenatured, under conditions similar to those governing the use of industrial methylated spirits, has already been described (*v.* page 257 R); and as a result of consultation between the Government Department and the Association, a rebate of the duty imposed by the Budget in respect of spirits used in medicinal preparations, or for scientific purposes, has been secured. The principle has also been established that the Association be consulted in all matters relating to the manufacture and use of industrial alcohol. Many of the misconceptions which existed regarding permissible denaturants have been removed, and the question of simplifying the restrictions and regulations is under consideration.

As the result of representations made on behalf of the Association, the percentage of phenol allowed in cresylic acid for export has been increased. Representations have also been made on behalf of nitric acid manufacturers that private plants should not be closed down while Government plants continue in operation. Nine members of the Association have been nominated to serve on the proposed Sulphuric Acid Advisory Committee. A request has been forwarded to the Board of Trade urging that an Advisory Committee be appointed to represent the various branches of the dye industry, and to collaborate with that Department in arriving at decisions affecting the industry. The Association has made its influence felt in connexion with various Electric Power Bills presented to Parliament; and among numerous other subjects engaging its attention are:—Patents, the Imports and Exports (Temporary) Bill, depreciation and stocks, chemical education, the formation of an information and statistical bureau, and the issue of an official directory.

TRADE NOTES.

FOREIGN

THE FORMOSAN SUGAR CROP.—Contrary to anticipation, the sugar crop this year in Formosa is expected to yield only 347,000 tons, which will be about 600 tons less than the previous year.—(*The Chem. Technol., March*, 1918.)

ALGERIA IN 1916.—Algeria is mainly an agricultural country, the chief forest product being cork, which is grown over an area of more than a million acres. The country is, however, also rich in mineral resources, especially in iron and phosphates. Copper, lead, zinc, antimony, and mercury are mined to some extent, but much exploitation remains to be done to show the extent of these resources. Coal is found in some abundance (this Journal, 1918, 178 R), while there appear to be excellent prospects for the production of mineral oils.

Few industries are carried out in the country, and most manufactured goods have to be imported. In normal times, France provided most of these materials, but during the war Great Britain has assumed the premier position. Thus, while in 1913—1914 France provided 91% of the chemical imports and Great Britain only 7%, in 1915—1916 France only provided 46% and Great Britain 47%.

The imports in 1916 included:—121 tons of tartaric acid; 3310 tons of calcium carbide; 22,268 tons of cement; 5344 tons of copper sulphate; 57 tons of dyes, valued at £9000; 2604 tons of chemical fertilisers; 215 tons of medicinal compounds, valued at £90,000; 438 tons of perfumes, valued at £87,000; 13,282 tons of soap; and 24,370 tons of sulphur. Among the products required by the local market may be mentioned iron and copper wire, pig iron, copper sulphate, paper, and chemical and pharmaceutical supplies.—(*U.S. Com. Rep. Supp., March* 28, 1918.)

German Chemical "Grossindustrie" in 1917.—The year 1917 was noteworthy for a general rise in capitalisation of the leading chemical manufacturing companies. Excluding the Leopold Cassella Company of Frankfort a/M., which raised its capital by 15 million marks to a total of 45 millions, the capitalisation of the other six leading companies in the Cartel ("Interessengemeinschaft") rose by 132,600,000 mk. to 338,400,000 mk. (£16,920,000). The increases in capital were in part designed to cover the outlay for new plant and buildings, particularly in the case of the nitrogen factories, but they were also intended to dilute existing capital in order to reduce the high dividend rates which had previously been the rule. It will be seen from the subjoined table, which summarises the financial achievements of the six companies referred to, that, although the average rate of dividend in 1917 was 7 per cent. less than in 1916, the total disbursement was nearly 10 million marks greater, and that the dividend distributions amounted to nearly one-half of the increased capitalisation. Except in the case of the Weiler-ter-Meer Company, all the new shares issued in 1917 were entitled to the full dividend rates.

German Potash in 1918.—The German Potash Distribution Bureau has allocated to the home and foreign markets respectively the following quantities of potash for the calendar year 1918 (in double cwt. of pure potash):—

	Home Market.	Foreign Market.
Carnallite of 9—12 per cent. pure potash	39,000	—
Crude salt, 12—15 per cent. pure potash	3,360,000	216,000
Sulphate of potassium—		
20—22 per cent. pure potash	1,191,000	638,000
30—32 per cent. pure potash	197,000	20,000
40—42 per cent. pure potash	2,551,000	365,000
Chloride of potassium	1,498,000	69,000
Tartarus vitriolatus, over 42 per cent. pure potash	272,000	13,000
Crude potassium-magnesium sulphate	78,000	54,000
Grand total	10,561,000	

—(*Deutsch. Reichsanz., Bd. of Trade J., June* 13, 1918.)

German Potash Imported into Norway.—The following figures show the amounts of German potash imported into Norway in recent years:—1912, 3660 tons; 1913, 3830 tons; 1914, 5115 tons; 1915, 3967 tons; and 1916, 4263 tons. During the spring of 1918, imports have been greater than normal, 4,662,075 kilos. being already in the country, and 988,000 kilos. en route.—(*U.S. Com. Rep., April* 2, 1918.)

Swedish Iron Exports and Imports in 1917.—The general results of the year were good, although profits were not so high as in 1916. 5,702,808 tons of iron ore was exported, an increase of 135,184 tons on the previous year, but the exports of iron (495,701 tons) fell by 77,366 tons. Iron was imported to the extent of 102,006 tons. The production of pig iron was 837,184 tons, an increase of nearly 10 per cent. over the previous year; Bessemer ingots (78,130 tons) showed an increase of 1118 tons; the production of Martin ingots (497,332 tons) showed on the other hand a decrease of nearly 7 per cent.—(*U.S. Com. Rep., Mar.* 30, 1918.)

Millions of Marks.	Issued Capital.		Divisn. of Profits.	Gross Profits.		General Charges.		Sums written off (visible).		Net Profits (incl. sums brought in).		Dividends.			
Company.	1917.	Increase on 1916.	Per cent.	1917.	Increase on 1916.	1917.	Increase on 1916.	1917.	1916.	1917.	1916.	Per cent. 1917.	Per cent. 1916.	Amounts. 1917.	Amounts. 1916.
Höchst	90·0	+36·0	24·82	51·2	+12·5	9·5	+3·9	19·2	+8·2	25·2	+1·0	18	−7	16·20	+2·70
Badische	90·0	+36·0	24·82	60·0	+17·4	8·8	+2·1	21·2	+8·8	33·3	+6·8	20	−8	18·0	+2·88
Bayer	90·0	+36·0	24·82	44·92	+ 6·8	4·9	+0·2	11·9	−0·2	31·1	+4·3	20	−8	18·0	+2·88
A.-G. Anil.	33·0	+13·2	8·08	16·3	+ 2·2	3·1	+0·5	4·9	+0·1	8·9	+1·6	18	−7	5·94	+0·90
Griesheim	25·0	+ 9·0	6·00	16·9	+ 2·3	3·3	+0·5	5·1	+1·6	9·7	+0·4	16	−6	4·0	+0·48
Weil. t. Meer	10·4	+ 2·43	1·65	5·6	+ 0·2	2·3	+0·6	1·2	−0·3	2·2	−0·1	12	—	0·96	—
Total ...	338·4	+132·6	—	194·9	+41·4	32·0	+7·7	63·4	+18·3	110·2	+14·0	18·78 (average)	−7·06	63·10	+9·93

In addition to the profits disclosed, there were also invisible profits, such as sums partly written off, or set aside for the war profit tax. Furthermore, by the terms of the arrangement, certain profits are to be excluded from the general balance sheet for a fixed period, *e.g.* those made by the Höchst Company in respect of carbide, cyanamide, etc., and the profits derived from the manufacture of synthetic ammonia and nitrates by the Badische Soda u. Anilin Fabrik.

"Tantièmen" (share of profits paid to certain employees) amounted to 8·25 million marks in 1917 or 0·62 million more than in 1916; amounts placed to reserves and investments totalled 26·83 millions, an increase of 2·67 millions; and the sums carried forward amounted to 12·01 millions, or 1·23 millions more than in the previous year.—(*Frankfurt.-Zeit., June* 5, 1918.)

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal,* June 20 and 27, 1918.)

OPENINGS FOR BRITISH TRADE.

British manufacturers of machinery for producing yarn from the nettle, of acetylene gas burners, and of spouts of galvanised iron for use in tapping rubber trees are requested to apply to the Department of Overseas Trade for the names of inquirers.

A British merchant in Bolivia able to secure 3000 quintals of cinchona bark per annum desires to get into communication with importers in the U.K. [Ref. No. 164.]

A firm in Auckland, New Zealand, wants agencies for U.K. manufacturers of, *inter alia,* cotton waste, paints, and paper. [Ref. No. 166.]

A Barcelona firm desires agency for U.K. manufacturers of soldering specialities. [Ref. No. 169.]

An agent in Caracas, Venezuela, desires agency for U.K. manufacturers of chinaware, glassware, perfumery, patent medicines, and paper. [Ref. No. 170.]

TARIFF. CUSTOMS. EXCISE.

British Baluchistan.—A notification dated April 6 in the *Gazette of India* of April 20 specifies the "British Baluchistan Morphia Rules, 1918." These rules may be referred to by persons interested on application to the Department of Overseas Trade (Development and Intelligence).

British India.—The export of coconut oil is prohibited to all destinations except the U.K. from April 20.

Canada.—The import stamp duty on matches is fixed at 1 cent per 100 matches or fraction thereof with effect from May 1.

Drawback of 99 per cent. is now paid on the imported materials used in the manufacture of wireless telegraph apparatus supplied to vessels in Canada subsequent to January 1, 1918.

Denmark.—The export of, *inter alia,* cullet (broken glass), calf skins of all kinds, seal skins and manufactures thereof, and skin clothing is prohibited.

France.—An import duty of 1 franc per kilogram is levied on liquid carbonic acid with effect from March 30. On small quantities the duty is fixed at 2 centimes per 10 grms. or fraction thereof.

A French Ministerial decree dated June 4 abrogates the decree dated February 12, 1915, and subsequent decrees, whereby certain articles, the export of which is prohibited, were allowed to be exported and re-exported to the Allied countries, and substitutes a list of articles which may be exported and re-exported without special authorisation to the U.K., Belgium (uninvaded territory), Italy, and extra-European countries. For the list, which includes many chemicals and drugs, see *Bd. of Trade J.* for June 20.

Italy.—The *Bd. of Trade J.* for June 27 gives a list of articles which can be exported only on the condition that the amounts due from abroad are ceded to the National Institute of Exchange. The list includes olive oil, essential oils, chemicals, matches, dyeing and tanning material, paper, skins and hides, glue, feathers, and scientific instruments.

Morocco (French Zone).—The export of locust beans is only permitted in so far as concerns such quantities as are not retained by the "Service de l'Intendance" and under licence issued by the Director of the Service.

Sweden.—The export of glass tubes and rectangular glass jars of at least 3·5 cubic decimetres for accumulators, and of manufactures of wax not specially mentioned in the tariff, is prohibited as from June 8.

South Africa.—The *Board of Trade J.* for June 20 gives some particulars of a Bill which has been introduced into the Union Parliament proposing, *inter alia,* to continue the operation of certain increased customs duties and to amend further the present customs tariff. Among the articles affected are collodion cotton, dyes, glycerin, kieselguhr, leather, paper, spices, turmeric, and tanning substances.

United States of America.—A copy of the new orders relating to control of hides, glue stock, skins and other animal by-products offered for entry into the U.S. may be seen at the Department of Overseas Trade.

COMPANY NEWS.

NOBEL'S EXPLOSIVES CO., LTD.

At the forty-second annual general meeting, held at Glasgow on June 12 last, the chairman of the company, Sir R. W. Anstruther, Bart., said that no settlement with the authorities concerning liabilities for munitions levy and excess profits duty had yet been effected, but ample sums had been set aside to cover all such liabilities up to the end of 1917. The financial position is a strong one, and, in view of the large reserve capital, the issued capital of £2,800,000 by no means represents the profit-earning capacity. The present prices for propellant powders are lower than the pre-war prices, wages and raw materials have risen considerably, but, on the other hand, methods have been improved and production greatly increased. The factories have worked uninterruptedly and at full capacity throughout the past year. Regarding the post-war future, it had been decided to extend the company's activities into other profitable fields of commerce, and some funds had already been invested with that object—*e.g.*, a large stock interest has been acquired in Levinstein, Ltd Negotiations with a view to the amalgamation of the firms employed in the explosives and allied industries have been taking place for the past 18 months, the preliminary work connected therewith is now nearing completion, and a scheme would probably be submitted in the course of the next two months.

The report, with the accounts for the two years ended December 31 last, was adopted; the 5 per cent. dividend on the preference shares and the 5 per cent. interim dividend on the ordinary shares, both already paid, were confirmed; and an additional 15 per cent., free of tax, on the ordinary shares was passed. £500,000 was allocated to reserve and £84,881 carried forward.

ZINC CORPORATION, LTD.

Speaking at the seventh ordinary general meeting held last month in London, the chairman, Mr. F. A. Govett, said the immediate future of zinc, lead, and silver was governed chiefly by lack of freight and the possibility of its long continuance after the war. The progress of the Associated Smelters, of which the Zinc Corporation was a co-partner, was of the greatest importance. The plant had a yearly capacity of 160,000 tons of lead, 5000 tons of zinc, and about 10 million oz. of silver. The smelters were limited to a profit of

7 per cent. Apart from the question of shipping, the future price of lead was likely to be remunerative. World stocks had reached an extremely low point, the metal would be in great demand after the war, and output would tend to decrease. Costs of production had everywhere increased enormously, against which there was some offset in improving metallurgical work and in higher silver prices.

The magnitude of the mine belonging to the Corporation is steadily increasing; although a million tons of ore have been extracted during the last seven years, the reserves now amount to 2 million tons. Good progress has been made in methods of zinc extraction. In addition to the electrolytic and chloride processes, two new processes, one invented by the Messrs. Elmore here and the other in America, are being tested. The chloride process, which is approaching finality of proof, appears to be the most promising.

The question of the formation of a company to erect smelters in England has not yet matured, and beyond the expansion of existing works and progress with the erection of works at Avonmouth, nothing has been done. Regarding the post-war future, it appears as if America will be able to produce more cheaply, and in larger quantities than other countries, since she has many available smelting works, and has recently developed large ore-deposits of higher grade. Although he and his co-directors were willing to join in any sound Government scheme for establishing a zinc smelting industry in this country, in order to make us independent of foreign supplies in the event of a future war, he did not think the matter an urgent one at the present time; such a scheme would be of extreme difficulty to initiate and the financial aspect, from the shareholder's point of view, would not be bright. The question is shelved at the moment, but it will be revived in view of the requirements of the brass and galvanising industries, for these will have to meet the formidable competition of America and Japan.

The company's contract of 1916 to supply the Government with 100,000 tons of zinc concentrates yearly was now cancelled, and a new contract had been made by which the Government took the whole of the output of Broken Hill (this J., 1918, 176 R). The terms of the contract were eminently fair, and they would give the company some certain profit.

FORTUNA NITRATE.

Owing to unremunerative forward contracts, the report of this company for the year 1917 is a disappointing one. After providing for income tax and depreciation, there is a net loss on the year's working of £9928, compared with a net profit of £46,327 in 1916; and no dividend is declared. Costs of production increased by no less than 1*s.* 6*d.*, representing £105,725 on the year's total of 1,409,668 quintals, the increase being chiefly due to the rise in the Chilean exchange (from an average of 9½*d.* for the paper dollar in 1916 to 12¾*d.* in 1917, and now 17$\frac{11}{32}$*d.*).

Addressing the annual general meeting on June 17, the Hon. H. C. Gibbs, who is the official adviser to the Nitrate of Soda Executive, announced that the Allied Governments had shown great consideration for the nitrate industry by raising the price to 12*s.* 6*d.* per quintal for ordinary and 13*s.* for refined nitrate. In his opinion these prices would be amply sufficient to allow a reasonable profit to producers even in the probable event of some further rise in costs. Negotiations are now in progress for placing all the nitrate production in the hands of the Chilean Government and for leaving it to deal with the Executive.

AGUAS BLANCAS NITRATE.

The gross profits in 1917 amounted to £68,584, and the net profits to £62,251; £15,918 has been expended on the redemption of debentures, £5000 placed to reserve, and a total dividend for the year of 13¼ per cent. passed and paid. The carry forward is £54,435, as compared with £50,533 brought in. Most of the remaining debentures have been paid off during the present year. It is proposed to make a return of capital, to the extent of 15*s.* per £1 share, to shareholders from the proceeds of the sale of some of the outlying grounds belonging to the company.

ANGELA NITRATE.

During the year 1917 a profit of £34,912 was taken on 427,777 quintals, *i.e.* about 1*s.* 7½*d.* per quintal. The corresponding figures for 1916 were £21,690 on 359,275 quintals, or 1*s.* 2½*d.* per quintal. Owing to the better results the dividend has been raised from 21⅞ to 25 per cent.; £7000 is placed to reserve, against £4000 a year ago; larger sums have been written off for depreciation; and the carry-forward has been substantially increased.

PUBLICATIONS RECEIVED.

A Handbook of Briquetting. *By* G. Franke. *Translated by* F. C. A. H. Lantsberry. *Vol. II. Briquetting of Ores, Metallurgical Products, Metal Swarf and Similar Materials, including Agglomeration. With Appendices, 4 plates and 79 illustrations. Pp.* 214. *(London: Charles Griffin and Co., Ltd.,* 1918.) *Price* 15*s.*

Chemical Combination Among Metals. *By* M. Giua *and* C. Giua-Lollini. *Translated by* G. W. Robinson. *Pp.* 341. *(London: J. and A. Churchill,* 1918.) *Price* 21*s.*

Publications of the Department of Mines, Canada. *(Ottawa: Government Printing Bureau.)*

Iron Ore Occurrences in Canada. (2 *vols.*) *By* E. Lindeman *and* L. L. Bolton. (*Vol.* 1.) Descriptions of Principal Iron Ore Mines. (*Vol.* 2.) Descriptions of Iron Ore Occurrences.

The Value of Peat Fuel for the Generation of Steam. *By* J. Blizard. *Bulletin No.* 17.

Mineral Springs of Canada. *By* J. Satterley *and* R. T. Elworthy. *Bulletin No.* 16 (*Part* 1.) The Radioactivity of Some Canadian Mineral Springs.

The Production of Iron and Steel in Canada in 1916; The Production of Coal and Coke in Canada in 1916. *By* J. McLeish.

The Production of Cement, Lime, Clay Products, Stone, and Other Structural Materials in 1916.

The Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and Other Metals in 1916.

Test of Some Canadian Sandstones to Determine their Suitability as Pulpstones. *Bulletin No.* 19. *By* L. H. Cole.

Preliminary Report on the Mineral Production of Canada in 1917. *By* J. McLeish.

Summary Report of the Department of Mines for 1916. 25 *cents.*

REVIEWS.

German-English Dictionary for Chemists. *By* Austin M. Patterson, Ph.D. *Pp.* xvi + 316. (*New York: John Wiley and Sons. London: Chapman and Hall,* 1917.) *Price* 9s. 6d.

Chemical French. An Introduction to the Study of French Chemical Literature. *By* M. L. Dolt, Ph.D. *Pp.* viii + 398. *Easton, Pa.: The Chemical Publishing Co. London: Williams and Norgate,* 1918.) *Price* 15s.

Ability to read French and German is an asset of great value to the chemist, and although a short-sighted policy of ostracism in regard to the latter language has been advocated in some quarters, the chemist simply cannot afford to neglect it, if he is to make effective use of the past and current literature of his science. It is the aim of the volumes under review to facilitate his equipment in this particular direction and to enable him to read scientific and technical matter in either language without undue difficulty or delay.

The two books, however, are designed to meet the needs of quite different persons. Dr. Patterson's compact dictionary, of almost pocket size, is for those who already have some knowledge of the German language and grammar, but do not command the requisite vocabulary of special technical terms. It is a workmanlike and serviceable production, based not only on existing large technical dictionaries, but on a fresh examination of text-books, journals, and dealers' catalogues. The author's previous experience as editor of "Chemical Abstracts" stands him in good stead, and is a guarantee that so far as the names of inorganic and organic compounds are concerned the information given is sound and trustworthy. In this connexion the portion of the introduction dealing with nomenclature will be found useful.

A novel and practical feature is the inclusion of German abbreviations, not only the usually occurring ones such as "u.s.w." and "z.B.," but also those occasionally encountered in chemical literature, as, for example, "wl.," "Kp.," and "u.zers."; these are entered in the vocabulary as if the letters composing them formed a word. Inspection shows that the list of contractions thus included is fairly exhaustive, and the only one the omission of which has been noticed is "resp.," a frequent source of trouble to inexperienced readers of German literature.

The characteristically German practice of using compounds of two or more ordinary words presents difficulties to the compiler of an abridged dictionary, for it is clearly impossible, without enormous increase of bulk, to include more than a part of the words of this class. It is comparatively easy to find compound words which are omitted from the present volume, such as "säurebeständig," "Windsichtung," and the priceless "Molekulargewichtsbestimmungsmethoden," but Dr. Patterson has deliberately left a good deal to common sense, and included only those general compound words which occur most commonly, and special technical terms such as "Bleicherde," "Anlauffarbe," "Tonbrei," "Blauholz," and "totgebrannt." As regards technical terms generally, the preface hints that some of the chemical industries may appear to be inadequately represented in the vocabulary. This is attributed to the fact that relevant glossaries are not available and to the present difficulty of obtaining German books.

Prof. Dolt's volume has the double aim of providing the beginner with elementary instruction in the French language and of furnishing an introduction to the study of French chemical literature. This second object, which is served by the reproduction of original articles by well-known chemists, such as Berthelot, Grignard, and Sabatier, is praiseworthy enough, and in this respect the volume should prove both interesting and valuable to the chemical student who has already acquired a general working acquaintance with the language.

It seems a pity that an effort has been made, in the opening chapters, to include also elementary instruction in French. One curious result of this attempt to achieve in one volume two objects which had much better been kept distinct, is the appearance of the closing passage from Madame Curie's account of researches on radio-active substances, in juxtaposition with a table of irregular verbs.

Acquaintance with the French language and grammar should be acquired, in the reviewer's opinion, in the course of general education. The idea, implied in the title of Prof. Dolt's volume, that chemists should proceed to familiarity with French along a special path, is fundamentally unsound, and leads to all sorts of absurdities. If a professor of chemistry is required to write on chemical French, there appears to be no limit to the number of similar volumes that might be produced, designed to meet the needs of the geologist, the botanist, the engineer and others.

James C. Philip.

OBITUARY.

D. C. BENDIX.

Born November, 1856.——Died June, 1918.

We regret to record the death of David C. Bendix, Fellow of the Institute of Chemistry, an original member of the Society of Chemical Industry, and for many years an abstractor for this Journal. The whole period of his business career was passed at Silvertown, London, E., where he was associated first with Messrs. Burt, Boulton & Haywood, Ltd., and afterwards with The British Alizarine Co., Ltd., with which firm he was connected for thirty-two years as head chemist and works manager.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Publishers are kindly requested to address books, &c., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.* [*Telephone: London Wall, No. 4249. Telegraphic Address: Induchem, Finsquare, London.*]

TRANSATLANTIC GREETINGS.

Our members will be interested to learn that on the occasion of the Annual Meeting of the Society held at Bristol on July 17, 18, and 19 (see this issue, p. 203 T), the following interchange of greetings took place between Mr. Allen Rogers and Prof. H. Louis on behalf of the members of the New York Section and of the English members respectively.

At the meeting of the Executive Committee of the New York Section, held at the Chemists' Club on July 10, the following resolution was proposed, seconded, and carried unanimously:

"That this Committee desires to extend greetings and good wishes to the officers and members of the English Section, and also assures them that the chemists and chemical industries of America are earnestly doing their utmost toward those programmes which will ensure victory to the Allied Cause and carry Truth and Justice to all lands and peoples."

In reply thereto the President of the Society transmitted the following message:

"On behalf of the British members of the Society of Chemical Industry I beg to cordially thank the Executive Committee of the New York Section for its good wishes, which they heartily reciprocate. It is gratifying to know that chemists on both sides of the Atlantic are working together as earnestly in their laboratories as are the united forces in the field, to attain that victory for which both nations are so sincerely hoping."

ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

ANNUAL MEETING.

The Second Annual General Meeting of the Association was held at the Chemical Society's Rooms, Burlington House, London, W., on Thursday, July 11, 1918. Dr. Charles Carpenter occupied the chair.

After the notice convening the meeting had been read by the Secretary (Capt. G. Mount, D.S.O.), and the scrutineers to examine the ballot papers had been appointed, the Chairman moved the adoption of the Annual Report of the Council of the Association, in presenting which he reviewed the work accomplished by the Association during the past year. He stated that satisfactory progress had been made, as evidenced by an increase in membership from 113 to 123 members, representing a corresponding increase of capital from £39,000,000 to £50,000,000. The Association had, however, sustained losses through the deaths of Mr. R. D. Pullar, who had proved a very valuable member of the Council, and of Mr. Thomas Tyrer, a prominent figure in the chemical world for many years.

In the course of his speech the Chairman emphasised the fact that the Association was now recognised by various Government Departments as the representative body to which matters concerning chemical industry should be referred, which indicated a considerable advance in its status. In the matter of Reconstruction, for instance, the Association had played an important part. A Committee, under the chairmanship of Sir Keith Price, had been appointed to advise as to the method of procedure which should be adopted for dealing with the Chemical Trade, and the recommendations arrived at between the Association and the Ministry of Reconstruction fully justified the personnel of the Committee. As a result of the deliberations of this Committee, it was decided that the Association should be recognised as the channel of communication between Government Departments and the chemical industries, not because it absolutely represented every part of the chemical industry, but because it substantially represented the industry. In connexion with the establishment of Joint Industrial Councils, the co-operation of the Association had been invited by the Ministries of Reconstruction and Labour. The Association was debarred by its Articles from dealing with questions relating to wages and labour, and although the Government was very anxious to deal with one organisation, it was considered inadvisable for the Association to interest itself in labour problems. Moreover the Chemical Employers' Federation had been specially constituted to deal with such matters, and it was the opinion of the Council that the only scheme which was practicable was one in which all Government questions relating to wages and labour should be considered by the Chemical Employers' Federation, and in which all other matters should be referred to the Association. This suggestion was accepted by the Authorities, and the Ministries of Labour and Reconstruction have agreed that the Association of British Chemical Manufacturers shall appoint an Advisory Committee, as representing British chemical manufacturers, to deal with technical and commercial questions affecting the chemical industry, not included within the scope of the Joint Industrial Council; and that in order to avoid overlapping and duplication of effort, the Advisory Committee shall appoint at least two Labour representatives who are members of the Joint Industrial Council, and at least an equal number of employers who are also members of that Council. It was further decided that the allocation of matters to either of these bodies for consideration shall be delegated to a small Committee of the Association, with a liaison officer, who shall be the General Manager of the Association. It will then be possible for any Government Department to get into direct touch with the chemical industry through the General Manager, and in this way the Association will perform the functions of a connecting link between the Government and the chemical industry as a whole.

The Chairman then dealt with the work of the Association in connexion with the governmental control of various branches of the industry. Regarding the question of Industrial Alcohol, he indicated the constructive work accomplished by the Alcohol Committee of the Association. The recommendations of this Committee had been accepted by the Chancellor of the Exchequer and the Inland Revenue Authorities, with the result that permission to use methyl alcohol undenatured had been granted to the chemical industry, whilst as regards ordinary alcohol a great deal of latitude had been given in respect of the denaturant to be used. Moreover, a definite position had been arrived at, in that the Authorities now recognised that in future the Association, as representing the chemical industry, must be consulted in matters pertaining to duty on alcohol. With respect to sulphuric acid, a similar satisfactory position had been attained. The Association had been invited by the Department of Explosives Supply to nominate representatives to serve on the Sulphuric Acid Advisory Committee—a proposal which has been welcomed by the Association. This was another indication of the recognition by Government Departments of the Association as the means of approaching any one branch of the industry. The position with regard to the manufacture of nitric acid was, however, not so satisfactory. The Association had made representations concerning the

action of the Government as regards the preferential closing of nitric acid factories erected by private initiative. It was the opinion of the Association that the effect of such a policy was detrimental to industry and enterprise, and that although such action might be regarded as immediately essential for the national safety in order to secure adequate supplies of nitric acid, yet there seemed to be no justification for operating Government plants in competition with those erected by private enterprise.

The Chairman then dealt at considerable length with the present position of the dye industry in this country. He outlined the points of view of the Government and of chemical manufacturers in connexion with this difficult question. The Government, realising the importance of placing the dye industry in such a position that it could supply the needs of the textile industry and also compete with foreign manufacture, considered that the concentration of the work in the hands of those firms, which may be described as known and tried, was the wisest policy to adopt. There was, however, the other aspect of the question—namely, that such a policy did not utilise all the resources of the country. Numerous undertakings were anxious to associate themselves in the development of this department of chemical industry, but their progress was impeded owing to their inability to secure the necessary facilities from the Government. The Association was of the opinion that a greater measure of national success would result if the co-operation of all manufacturers in this branch of the industry was secured. Representations had accordingly been made to the Board of Trade to the effect that an Advisory Committee should be constituted to collaborate with the Department, but it was regretted that no measure of success could be reported in this respect at the present moment.

With regard to the work of the Association in connexion with questions of trade, the Chairman referred to the preparation of the Association Directory. It was reported that the directory was now well in hand, and would be printed in English, French, Italian, Spanish, Portuguese, Russian and Japanese, thus providing for a very comprehensive circulation throughout the markets of the world of information relating to British manufacture of chemical products. With reference to foreign trade, a useful system was in operation for placing at the disposal of members of the Association information which is being circulated by the Foreign Office. This scheme, whereby possible customers in different parts of the world are put into touch with members of the Association, had been the subject of approval by those members who had availed themselves of it.

The objects and methods of procedure of the Statistical and Information Bureau were dealt with in considerable detail by the Chairman. The aim of the bureau was to avoid overlapping, and waste of time and energy in research and manufacture, and it was hoped that if all members co-operated in this matter the scheme would prove successful in dealing with what is one of the difficult problems facing chemical industry at the present time.

In connexion with the extension of chemical knowledge it was reported that the Council had supported the efforts of the Chemical Society in establishing a comprehensive library of chemical technology. The desire was not only to extend the library, but to extend the hours during which it was available, and in financially supporting this scheme the Association was contributing to the future welfare of chemical work in the country.

In conclusion, the Chairman referred to the organisation of the Association generally and to the success which had attended the present system of control and procedure. The various groups were maintained in close touch with the Council through the Group Chairmen, and the attendance of Group Chairmen at the Council meetings had resulted in increased vitality of the Association. Reference was made to the appointment of Mr. W. J. U. Woolcock, O.B.E., as General Manager of the Association, and to that of Captain G. Mount as Secretary. Although the appointment of suitable persons for filling these positions had been no easy task, Dr. Carpenter assured the members that in these two officials they had two men admirably suited in every way to carry out the duties assigned to them.

The motion for the adoption of the report was seconded by the Vice-Chairman, Mr. R. G. Perry, and, after discussion, was carried unanimously.

Messrs. Feasey and Co. were elected auditors for the ensuing year, and after the scrutineers had reported the result of the ballot the Chairman declared the constitution of the new Council and Group Committees, and moved a vote of thanks to the Chemical Society for the use of their rooms. This was seconded by the Rt. Hon. J. W. Wilson and carried unanimously.

The Vice-Chairman, in moving a vote of thanks to Dr. Carpenter, stated that for two years Dr. Carpenter had been the main support of the Association. Ever since the inauguration of the Association he had played a greater part than anyone else and had worked unceasingly in furthering its interests. The motion was seconded by Mr. Roscoe Brunner, who expressed his admiration of the way in which Dr. Carpenter had led the Council in all its work. The vote of thanks having been most heartily accorded, and Dr. Carpenter having replied, the proceedings then terminated.

At the subsequent Council Meeting the Rt. Hon. Lord Moulton was invited to occupy the position of President of the Association for the ensuing year, and has since accepted. At the same meeting Mr. R. G. Perry, C.B.E., was elected Chairman of the Association in succession to Dr. C. Carpenter, and the Rt. Hon. J. W. Wilson, M.P., Vice-Chairman of the Association.

CONVENTION OF CANADIAN CHEMISTS.

The first general convention of Canadian chemists was held at the Chateau Laurier, Ottawa, on May 21 and 22, under the presidency of Mr. Theo. H. Wardleworth, Chairman of the Canadian Section of the Society of Chemical Industry. There was a large and representative gathering.

A visit to the Mint on the first day was followed by an evening session, at which a paper was read by Professor M. C. Boswell, of Toronto University, on "Chemical Research in Agriculture." On the following morning an address was delivered by Professor M. A. Parker, of the University of Manitoba, on "Organisation of Canadian Chemists." The address and subsequent discussion followed the lines recently taken in this country with reference to the British Association of Chemists and the Institute of Chemistry, and showed that the need is felt in Canada of raising the status of the professional chemist and securing his adequate remuneration. "In Canada chemists form a rope of sand. Dentists, engineers, lawyers, doctors are fully organised—chemists have no organisation." Eventually the following resolution was passed:—

"That it is desirable to form an association of chemists, and that the chairman nominate a committee to consider the matter and report at a future meeting." The Secretary is Mr. Harold J. Roast, 393, Guy Street, Montreal.

At the afternoon session the Council of the Engineering Institute of Canada greeted the Convention, and Mr. George H. Tomlinson, of Niagara

Falls, read a paper on the "Present Status of the Industry of Ethyl Alcohol from Wood Waste." The process consists in heating the wood under pressure with a dilute hydrolysing acid and fermenting the resulting glucose. Hydrochloric and sulphurous acid are of equal efficiency, but the latter is cheaper. A yield of 35 gallons of 95 per cent. alcohol per dry ton of wood is aimed at. Yellow pine, white pine, spruce, or fir yields similar results. The discussion had reference to duty-free alcohol, and it was agreed to petition the Government on the subject.

Dr. A. McGill then spoke on the "Standardisation of Benzine and Gasoline," and advocated the adoption of a Government standard for motor fuels. In the subsequent discussion the question of gravity and boiling point was considered, and also the extent of the oilfields available for the Allies.

A memorandum by Mr. Pirrie was then read on "Essential Chemical Industries and the War." The writer proposed that a small committee be formed to advise the Government on the case of every chemist called up for military service. A motion to this effect was carried.

Mr. T. Linsey Crossley then spoke upon the need for technical education in Canada. He referred to the report of the Royal Commission of 1910, which recommended that a system of technical education should be established under provincial control, and called attention to the present waste of time, material, and man-power, as well as to the unsatisfactory relation between capital and labour, due to lack of education on both sides. A resolution was then passed that the chemists of Canada urge the Canadian Government "to take some immediate steps towards the adoption of a uniform inter-provincial system of primary education, and in the meantime take action on the report of the Royal Commission on Industrial Training and Technical Education."

Dr. Alfred Tingle read a paper on "The Hydrated Forms of Normal Barium Sulphate," and stated that three hydrates exist: (1) $10BaSO_4{\cdot}H_2O$ precipitated from hot neutral solutions; (2) $10BaSO_4{\cdot}2H_2O$ from hot acid solutions; and (3) $10BaSO_4{\cdot}4H_2O$ from cold acid solutions.

Dr. H. S. Davis read a paper on "Recovery of Light Oils from Gases," and Dr. J. T. Birchard one on a "Standard Method of Estimating Moisture in Wheat."

An informal dinner was held in the evening, after which Mr. Alfred Burton, the Secretary, presented a report on "Essential Chemical Industries," and Mr. M. L. Davies made some observations on the "Hardwood Distillation Industry of Canada," which led to another general discussion as to the importance of technical training, and the future application of chemistry to industry.

—(*Through the Canadian Chemical Journal.*)

A PATENT LAW FOR THE BRITISH EMPIRE.

J. W. GORDON.

The necessity for a well devised patent law in the development of the industrial resources of the British Empire is so well understood that the importance of a plan of legislation having the improvement of that law for its object may be taken for granted.

Obvious considerations point to the conclusion that a patent law devised for the United Kingdom needs substantial modification if it is to serve the purposes of the British Empire. But only once in our history have they had any influence upon our legislation. Down to 1852 Englishmen had not realised that the "plantations" of the sixteenth and seventeenth centuries had developed into a world-wide Dominion and one that contained the promise of an Empire more august than that of Rome. Thirty years later by the Act of 1883 the British Empire patent devised in 1852 was set aside to make way for the patent of the International Convention. In that connexion the British Colonies and our Indian Dependency were relegated to the rank of foreign countries, and since that date the patent law of the British Empire has been one of the disintegrating influences against which the makers and maintainers of that Empire have had to do battle.

The remarkable Act of 1852 can only receive the briefest notice in this article, but there are two points in that connexion which may be usefully discussed. They are:—

1. The organisation of the Patent Office.
2. The scheme of an Imperial Patent Grant.

1. In respect of the organisation of the Patent Office the problem before the Legislature in 1852 was a smaller edition of the Imperial problem which confronts us to-day. The three Realms of the United Kingdom had in 1852 three entirely distinct Patent Offices and Patent Office establishments. To obtain a grant for the whole of Great Britain and Ireland necessitated three applications, three sets of fees, three sealed patents. In like manner to-day the protection of an invention throughout the British Empire requires forty-five applications, the payment of forty-five sets of fees and the issue of forty-five sealed documents. The present problem, by comparison with that earlier one, is aggravated not only by its larger dimensions but by the circumstance that eight of the self-governing Colonies have instituted official examinations as to novelty, so that the forty-five applications involve nine proceedings more or less of the nature of patent actions before the full grant can be secured. It is manifest that the occasion for reform is much more urgent now than it was in 1852, and that, in so far as it was successful, the precedent of 1852 merits the most careful study at the present time.

In one respect, and that the one now under immediate consideration, the Act of 1852 was completely successful. That is to say it effected the full unification of the three Patent Offices. This was accomplished in such a way as to preserve all the advantages of local administration by the expedient of embodying the heads of the three patent offices in one Commission for the United Kingdom with co-extensive jurisdiction over its three territorial divisions, and then leaving them to distribute the administrative work according to the exigencies of the business to be dealt with.

No simpler or more elastic expedient can be suggested for laying the foundations of a consolidated Patent Office Administration, nor any that would be better adapted to the conditions obtaining in the British Empire. A commission in permanent function consisting of all the Law Officers at present in charge of Patent Offices within the British Empire would constitute an admirable consultative body for deliberating upon questions of patent law and patent law administration, and none the less efficient because its consultations would be not simply periodical and ceremonial, but also, and in the main, continuous and informal. The facility which the Joint Commission would afford to the local man for paying visits and adding to the duty of presiding in his own Patent Office that of assisting in the despatch of business in other Patent Offices, would have a strong and beneficent tendency to promote the efficiency of the administration in every part of the Empire. This pooling of experience and these facilities for acquiring the teachings of experience are among the chief advantages of extended Empire, and it would be all to the good if patent law reform drew

attention to the great possibilties which at present lie dormant in this situation.

2. But, however important in itself, the organisation of the Patent Office must be subordinate in public interest to questions concerning the effect and operation of the Imperial Patent Grant. Under this head it is not possible to speak with so much confidence, for the attempt made in 1852 to solve this problem was by no means successful. Provision was made that any patent issued in the United Kingdom might be extended so as to hold good in one or more of the British Colonies, and upon registration should take effect within the registering Colony for the remainder of the term for which it ran in the Mother country. The form of the grant was not modified in any way to meet the new circumstances, and there was no reciprocal provision for the extension to the Mother country or to other Colonies of a grant originally made by a Colonial Government. It is obvious that such a scheme could not even be submitted for discussion at the present time, and that in any new proposal for facilitating the grant of Imperial Patent Rights, reciprocity of prerogative as between the different constituent parts of the British Empire must be provided for, and the nature of the extended grant must be carefully considered and accurately defined.

At this point it is of interest to inquire whether the later developments of our Patent Law afford any useful suggestions. For these we must perforce turn to the measures adopted in establishing the International Convention, and here, although considerable modifications will be called for, it will be found that certain parts of the machinery devised may be usefully adapted to the new purpose.

The scheme of the International Convention is this. Any applicant for a patent in one of the Convention countries may take the date of his application in the country in which he first applies as the date of his application in all the Convention countries, so that he may subsequently present an application in any other Convention country and get it ante-dated to the date of that first application. For all purposes of subsequent patenting his original date is deemed to be the date to which his later grants relate and he enjoys priority over other applicants and patentees accordingly. The only limitation upon this privilege of priority is that it must be made operative within twelve months of the original date; or, it lapses.

This scheme is obviously but ill adapted, as it stands, to the case of the British Empire. In fact it has been in operation within the British Empire since 1883 and has effected nothing for the promotion of the solidarity of industrial interests under the British flag. On the contrary it has been largely exploited by foreign patentees to the detriment even of national industries. In the working out of the scheme of the International Convention the idea of independent sovereignty in each of the contracting parties was one of the main considerations kept in mind, and the more jealously, because that independence was being in a measure trenched upon by the arrangements made. To limit the infringement and preserve the substance of independent control of the grant of patents was one of the chief preoccupations of the draughtsmen of the treaty.

The expedient adopted for safeguarding the domestic authority of the several Governments was that of limiting the privilege to a right to apply for a patent and restricting the privileged application within a narrow limit of time. Everything else; the conditions under which the grant could be made, the terms in which it should be expressed, the period for which it should run—everything, indeed, that is matter of substance, save the single point of priority, was left untouched and the privilege of priority was itself limited to twelve months. As between independent States with very distinct systems of patent law and patent right such restrictions upon the right of transplantation were inevitable, but they have, and were designed to have, the effect of restraining the practice of transplantation within narrow limits in order that alien control of domestic industries might not by means of such derived patent rights grow up unchecked.

Now this suspicious attitude, natural and inevitable as it is between rival industrial States—between Germany and England for example—is wholly unsuitable to the relationship between Great Britain and the Britains overseas. It was a fatuous policy ever to apply such a system to the British Empire, and high time it is for that policy to be amended. So much is obvious. The only point that calls for discussion is the question on what lines the amendment should proceed.

If the problem has been correctly stated, the outlines of the solution will suggest themselves. Clearly, it is expedient to incorporate in the Imperial System the principle of transplantation of patent rights. Extension by registration for a term to run concurrently with the duration of the mother patent must be the governing principle of the scheme. But instead of being applied in a one-sided way its application must be framed upon reciprocal lines so that the same open door to all parts of the British Empire may be presented to the patentee overseas as to the patentee in the Mother country.

It will be said:—"But this will give rise to hopeless confusion and boundless trickery. You will have people taking out patents in the Bermudas and letting them lie vacant and unknown until somebody else has established a valuable business in London or Toronto or Sydney, and then registration will be applied for and all the profits of the other man's enterprise will be appropriated by the lucky patentee." To this there is a complete answer, although it must be admitted that the objection is not wholly unfounded in observation. For something more or less like that does happen, now and again, under our existing patent law, with its separate patent offices and incommunicable patent rights. But the answer is that a transplanted patent would have to be taken subject to vested rights acquired by user before the date of transplantation. The vindication of those rights would present no difficulty, for machinery suitable for the purpose has already been devised and brought into use to serve another but closely analogous purpose. For protecting the industrial public against the monopolist patentee a system of compulsory licensing has been introduced into British patent law and adopted in nearly all the British Dominions. By means of a suitably modified system of compulsory licensing it would be possible to protect all such rights of user as the Legislature thought fit to recognise, and in this way the only practical difficulty that can be suggested would be completely met. The illustration of this plan in operation would however take more space than can be allotted to this article.

According to a report received in South Africa from the Imperial Institute on the commercial value of sunflower pith, rods made of this material absorb about 95 per cent. of their weight of nitroglycerin under pressure, and a useful explosive for local needs might be made therefrom, although probably some nitrate would have to be added to make combustion complete. The pith would not be of technical value for making nitrocellulose. It is further suggested that the pith might be utilised as an insulating material in refrigerating plant.—(*S. Afr. J. Ind., Apr.*, 1918.)

MAPLE SUGAR.

The following account is based upon a bulletin: *Maple Sugar: its Composition and Methods of Analysis,* issued by the United States Department of Agriculture (No. 466. Nov. 3, 1917).

Maple sap is drawn from the living maple tree by boring two or three holes in the stem, a few feet above the ground, and inserting a metal tube into each hole. The sap flows through the tube and is caught in vessels of tinned iron suspended therefrom. The sap is collected from these vessels twice a day throughout the "sugar season," which lasts for about three weeks in each year. A single tree yields from 12 to 24 gallons of sap during one "season," and one pound of maple sugar is obtained from $4\frac{1}{2}$ to 6 gallons of the sap. The latter is conveyed to the sugar factory and there converted into the various commercial products described below.

Maple Syrup.

This is produced by two methods:—(a) The sap is concentrated by boiling until it contains 35% of water, and weighs 11 pounds per gallon (231 cub. in.); or, (b) by dissolving crystallised "maple sugar" in water to form a syrup of the same concentration as in (a). The syrup made from sugar has a more uniform flavour owing to the mixing of various grades of maple sugar in its manufacture, but is much darker in colour than the syrup made direct from the sap.

Sometimes, the sap is purified by adding chemical agents, which precipitate some of the impurities, the latter being then removed by skimming, sedimentation, or filtration; but, more generally, the sap is concentrated and crystallised without previous purification, by merely evaporating the contained water.

Maple Sugar.

Purified maple sugar is sucrose, and therefore the same substance as is extracted from the sugar cane, sugar beet, and other plants. The commercial value of maple sugar depends not so much on its sweetness, or percentage of actual sucrose, as on its flavour, which clearly distinguishes it from cane and beet sugars. As this flavour is due entirely to the non-sugars or "impurities" present in the original sap, no attempt is made to separate completely the mother-liquor in which the crystals are formed, and this dark syrupy fluid, adhering to the crystals, imparts its colour to them.

The sugar is manufactured either directly from the sap, or after this has been concentrated to syrup. In both cases, the boiling is continued until a strongly supersaturated syrup is obtained, which crystallises on cooling; the degree of concentration varies with the grade of sugar to be made. These grades are described below.

"*Stirred sugar,*" also called "*grain, or crumb sugar,*" derives its name from the fact that the supersaturated syrup is kept stirred during cooling and crystallisation. This permits fewer crystals to be formed and causes the growth of these crystals in the form of distinct *grains* or *crumbs.* The product varies in colour from nearly white to light brown; it is fairly dry, and resembles ordinary brown cane sugar in appearance.

"*Cake sugar.*" The syrup, after crystallising, is compressed into cakes, varying in weight from one ounce to several pounds. Cake sugar may be classified as soft and hard. The small cakes are of the soft variety, readily dissolving in the mouth, and are sold as confectionery. The large cakes are of the hard variety, or "brick sugar," to permit of shipment without cracking. The cake sugars are inferior in quality to "stirred sugar," and vary in colour from yellow to black. The darker varieties have a stronger flavour, and contain caramel.

"*Tub sugar.*" The sap or syrup is concentrated to supersaturation, cooled slightly, and then run into wooden or metal tubs (containing from 10 to 50 pounds each) in which crystallisation takes place during cooling and without stirring. After this, the mother-liquor is drained off from the bottom of the tub. As this grade of sugar is made from the drainings of the previous grades, it is very dark in colour, also soft or moist when ready for shipment.

Maple Cream or Butter.

The syrup is boiled to a slightly higher density than for "soft cake" sugar, described above, and very rapidly cooled whilst being vigorously stirred. The treatment produces an abundance of minute crystals which fail to grow, but which resemble "icing sugar." The crystallised material has therefore no distinct grain, but is a soft semi-fluid resembling cream.

Maple Honey.

The ordinary maple syrup is concentrated to such a degree that no crystals are formed even after cooling; it is therefore merely a thicker form of syrup. The syrup, from which it is made, should contain a high percentage of invert sugar which hinders the sucrose from crystallising. As bees do not assist in the manufacture, the name given to this product is misleading.

Maple Wax.

The sap or syrup is concentrated nearly to the density required for producing "hard cake sugar," and the hot syrup is then poured over snow or powered ice. The rapid cooling is said to prevent crystallisation, yielding a material resembling wax. Probably a microscope would reveal very minute crystals in this "wax," and the fact that the waxy condition disappears after a short time may be due to the gradual growth of these crystals until the mass becomes granular.

The Bulletin describes the methods of sampling and analysis, and tabulates the analytical results of 283 samples of maple sugar manufactured in the United States, also of 80 samples of Canadian maple sugar. The following is a summary of the results:—

	Colour	Sucrose %	Invert Sugar %	Ash %	Alkalinity sol. ash / insol. ash	Alkalinity sol. ash / insol. ash	Lead Number Winton	Lead Number Ross	Malic acid value
U.S.A.—maximum	21	98·62	37·30	1·66	4·07	2·29	4·95	5·90	1·72
minimum	8	57·04	0·09	0·76	0·61	0·37	1·85	2·20	0·51
mean	13	91·89	5·46	0·95	1·88	0·90	2·68	3·34	0·91
Canada—maximum	17	96·59	35·26	1·70	3·20	1·54	4·14	—	1·51
minimum	−8	58·92	0·88	0·76	0·43	0·40	1·86	—	0·62
mean	10	86·48	8·76	1·06	1·36	0·76	3·04	—	1·03

The colours were measured by comparison with the well known "Dutch Standards," which are samples of sugar varying in colour from very dark brown (No. 8) to a pale yellow (No. 25). Hence, the lightest of the American samples was equal to No. 21 of the standard samples, and the darkest was equal to the darkest of the standard tints. The darkest of the Canadian samples was still darker than any of the standard tints, and this is indicated by the negative sign attached. The colour of maple sugar is not necessarily an indication of its quality and market value, for, as stated above, the flavour is the chief consideration. The percentage of moisture varies from 0·65 to 8·4% in "stirred sugar"; from 1·43 to 7·40% in "hard cake sugar"; and from 9·6 to 11·2% in "soft cake sugar."

NEWS AND NOTES.

AUSTRALIA.

New Method of Roasting Zinc Concentrates.—An interesting application of the Dwight-Lloyd sintering machine for eliminating sulphur from partially roasted zinc concentrates has been successfully worked out at Port Pirie. As is well known, the removal of from two-thirds to three-quarters of the sulphur in Broken Hill ore requires little fuel and proceeds rapidly in furnaces of the reverbatory or muffle type, but the further reduction of the sulphur content has long been a matter of difficulty. By means of the machine above-mentioned (which has proved of great service in the roasting of lead sulphide ores) the 10 per cent. sulphur content of the partly roasted concentrates can be rapidly and economically brought down to 1 per cent. Certain precautions are necessary, but with no more fuel than is required for the preliminary ignition, the partially roasted ore is converted into a friable material which is easily crushed, and which gives excellent results in the distillation furnace. The retort charge is found to require a smaller proportion of coal, and the retort capacity is increased by 15 per cent.—(*Mining Mag., June*, 1918.)

Coal and Shale Production in New South Wales and Queensland.—The output of coal in New South Wales for 1916 was 8,127.161 tons, valued at £3,336,419, whilst that for 1917 amounted to 6,292,867 tons, valued at £4,422,740. The quantity of shale raised during 1917 totalled 31,661 tons, valued at £30,565, as against 17,425 tons, valued at £17,777, in 1916. Considerable quantities of shale are regularly shipped each month to the United States.

The total output of coal in Queensland in 1917 amounted to 1,048,473 tons, valued at £597,360, compared with 907,727 tons, valued at £389,348, for 1916. The average value of the coal at the pit's mouth (11*s*. 4·7*d*.) was 2*s*. 7·8*d*. higher.—(*Coll. Guard., June* 28, 1918.)

CANADA.

Platinum in British Columbia.—The Canadian Government is about to investigate the platinum yields in the Tulameen and Similkameen Valleys in British Columbia. These regions contain not only platinum, but also osmium, iridium, and gold in the sands and gravel. The outlook is said to be promising.—(*Can. Chem. J., June*, 1918.)

British America Nickel Corporation.—An agreement has been arrived at between the Ontario Government and the British America Nickel Corporation under which the nickel refinery of the company will be erected at Deschenes, near Hull, Québec. The buildings and equipment will cost about a million dollars, and it is expected that ore from the Sudbury mines will be treated at the new works within the year.

Oil Discovery in Northern Ontario.—Strong indications of oil have been observed in the Sudbury district on the boundary of Street and Scadding townships, about seventy miles northwest of North Bay. Many claims have been staked and drilling is now going on. A large oilfield in this locality would be of great value to a number of chemical industries. A new well with an initial flow of over 200 barrels a day has been struck in Dover township near Chatham.

UNITED STATES.

Influence of the War on Technical Training.—The same problem is before the United States that had to be met in England and France. Owing to enlistment, the higher institutes of learning are becoming seriously depleted, the total loss to date being estimated at 68,500. If the struggle endures, the problem of obtaining an adequate supply of properly trained men will become acute.

A New Type of Electric Furnace for Brass Manufacture.—The U.S. Bureau of Mines has been conducting experiments for some time past to overcome the anachronism of the use of crucibles in brass manufacture. The dearth of Klingenberg clay and Ceylon graphite no less than the necessity to obviate loss of zinc due to volatilisation, and injury to the health of the workers, call for immediate advance over the ancient Egyptian method. No type of electric steel furnace will answer. A number of research laboratories are at work on the problem and there are several experimental plants in operation, but the problem of the Bureau was to devise an electric furnace to melt successive heats of alloys differing widely in composition, to handle alloys both free from zinc and high in zinc, and to operate cheaply on a 9 or 10 hour day.

It is believed that the Bureau has made a distinct and valuable contribution in its rocking type of electric furnace, by which the loss of metal is decreased by approximately one half. The output per man is markedly increased and the health conditions are excellent. The cost of melting on a ten-hour schedule in the rocking electric furnace on the one hand, and in the coke-fired crucibles on the other, shows that the expense per ton for electric power, interest and depreciation, electrodes, linings and for heating ladles, is just about half the cost per ton for the single item of crucibles at present prices and at their present life. The value of the metal saved is about twice the cost of coke used for the coke fires. The rocking type may be built in both large and small sizes. A detailed account will soon be published in Bulletin 171 of the U.S. Bureau of Mines.

GENERAL.

Coal Meter.—The Lea Recorder Co., Ltd., has recently brought out an appliance for "measuring" coal, as directly fed to boilers fitted with chain grates. The rate of feed of coal on such a grate must of course be changeable. It depends upon three factors—depth, width, and speed of travel. Of these the first is variable, governed by the height of the doctor bar, which is set by hand to suit the class of fuel; the second is constant; the third is variable, controlled by hand to suit the demand for steam from time to time. The counter or integrating device is driven at constant speed from the same source of power that drives the grate mechanism, but connexions with the ratchet or similar speed gear and with the doctor, accelerate or delay the register. The net result is the cubic measurement of the film of coal passing under the doctor bar per hour or day. Obviously the indication is less accurate and dependable than a gravimetric process, but the device may prove of utility in practice as a guide to and check upon the boiler attendants.

Oil and Colour Chemsts' Association.—An association of chemists engaged in the oil, colour and allied trades has been formed for the purpose of considering and discussing the many complex points which are continually met with in the course of their work. The need for such an association has been felt for a long time past, and the work undertaken by the chemists of the paint trade on linseed oil substitution products has been the foundation on which this association has arisen. A considerable measure of success has been accorded to the society since its inauguration, and it is hoped that as the need is realised and the

advantages of the Association are fully appreciated, all chemists engaged in the allied industries will become members. An administrative council has been appointed, and Dr. F. Mollwo Perkin has been elected president.

At the first meeting, held in London on June 17, Mr. W. J. Palmer read a paper on "The Necessity for the Standardised Testing of our Raw Material." The systematised testing of the raw materials used in the paint and varnish industry has received little or no attention in this country; such work has been left almost entirely to the American Society for Testing Materials and to the Bureau of Standards, Washington. The author considers that the promotion of a general scheme to ensure the systematic testing of raw materials should be actively taken in hand by the new association, and suggests that a start should be made upon some half-dozen materials, the physical and chemicals tests adopted to be based upon the literature published by the American Society. The tests should not be confined to those of a purely chemical nature, but should include physical tests bearing a direct relationship to the purpose for which the material is intended.

Co-ordination of Chemical Abstracts in Germany. —The issue of the *Berichte der Deutschen Chemischen Gesellschaft* for April 13, 1918, contains the text of an agreement arrived at between the Deutsche Chemische Gesellschaft and the Verein Deutscher Chemiker concerning the joint publication of abstracts. It provides for the discontinuance of the "Referate" section of the *Zeitschrift für angewandte Chemie*, and for the enlargement of the "Technischer Teil" of the *Chemisches Zentralblatt*. The latter is to be prepared and edited, as previously, by the German Chemical Society, but the Verein will pay an annual contribution of 25,000 marks towards the cost. Subscriptions to the two societies are to be arranged according to the publications desired by the members. The Verein is to pay the costs of printing, paper, and binding for the copies of the "Technischer Teil" of the *Zentralblatt* required by its members, and undertakes the despatch of these copies to them. The *Zentralblatt* will be divided into a "Wissenschaftlicher Teil" and a "Technischer Teil," the former comprising sections on general and physical chemistry, inorganic, organic, physiological, medicinal, mineralogical and geological chemistry, and bibliography; and the latter, sections on apparatus, analytical chemistry, technical chemistry, and patents. With regard to borderland subjects, it is provided that abstracts on fermentation chemistry, with the exception of those of purely physiological interest (foods, soils and fertilisers, and most of those on pharmaceutical chemistry), shall be included in the technical part, and abstracts on bacteriology, most of those on hygiene, and those on agricultural chemistry of a physiological character, in the scientific part of the *Zentralblatt*.

The agreement includes provisions in regard to the settlement of difficulties, to arbitration, and to the sale of the *Zentralblatt* to non-members and to booksellers. Subject to confirmation by general meetings of the two societies, the agreement will take effect from January 1, 1919, for a period of 10 years, and thereafter for successive periods of 5 years, unless 1 year's notice of annulment be given by either of the societies.

The Castor Oil Industry.—Since the outbreak of war, castor oil has come into enormous demand as a lubricant for aeroplane engines, motors, etc., and the extent of the industry is increasing rapidly. Thus the English production of castor oil before the war averaged 15,000 to 20,000 tons per annum, but had fallen by 1915 to under 10,000 tons. Now, however, it has reached the total of 3500 to 4000 tons per month, special facilities having been given for importing castor seed from India. It is interesting to note that Germany, anticipating the war, doubled her imports of castor seed and oil in 1913 and in the first half of 1914.

A big demand for the product has also arisen in the U.S.A., and has been partially met by supplies from England. Efforts are now being made to plant no less than 200,000 acres of land in the Southern States and the Pacific Coast with Indian seed, Government contracts guaranteeing the grower from \$3·00 to \$3·50 per bushel. Previous to the war, the American production of the oil was valued at a million dollars. It was pressed from Indian seed, 814,000 bushels of which was imported in 1913. By 1917, the imports had risen to 1,041,000 bushels.

India is the chief producer of castor seed, but the total production of castor oil is difficult to estimate, owing to the greater proportion being used in native industries. The exports of oil from India have risen from 898,000 gallons in 1914—1915 to 1,723,000 gallons in 1916—1917, while the export of cotton seed has shown a corresponding increase.

Other countries which have been developing the production of castor oil are China, Indo-China, South Africa, and especially Brazil, where the plant flourishes wherever it is introduced. 100,000 acres in the West Indies have been planted with Indian seed. Many castor oil plants, all morphologically connected, exist in the West Indies, all varying greatly in commercial importance, though much work has still to be done to determine the most suitable types. In this connexion, the St. Vincent Experimental Station has produced a new hybrid between two types of *Ricinus* which may prove to be a new source of oil.

One of the results of the new demands on the world's production of castor oil has been to cause a shortage in the pharmaceutical product, but it is hoped that supplies will be easier in the near future.—(*Chemist and Druggist, June* 29, 1918.)

Chemical Utilisation of Seaweed.—During the last few years Swedish seaweed has been coveted by the Germans, who make it into fodder, and also use it as a source of valuable chemical products. A series of experiments, carried out with profitable results at Stockholm, have shown that by the dry distillation of 1 kilo. of dried seaweed the following products can be obtained:—Illuminating gas, 30—32 litres; carbon, 43 per cent.; distillates (acetic acid, methylated spirit, formic acid, acetone, etc.), 35 per cent.; salts (sodium sulphate, potassium sulphate, potassium chloride), 14 per cent.; and, in addition, iodine, bromine, a very aromatic tar product, and carbolic tar, an excellent preservative of timber. The Focus Co. is about to start a factory at Varberg, with a yearly consumption of about 1000 tons of seaweed, estimated to yield 20,000 cub. m. of gas, which will be used for working a gas motor to draw water from the sea for cooling purposes. On account of the scarcity of artificial manure the factory will this year produce principally sodium sulphate, potassium sulphate, and potassium chloride, for the manufacture of a fertiliser containing 37 per cent. of potash.—(*Svenska Dagbladet, May* 12, 1918.)

Serbian Sources of Copper.—The copper mines of Serbia have proved an important source of supply of that metal to the Central Powers during the war. The output before the war was considerable, 5335 tons in 1910, increasing to 7600 tons in 1913. Since the war began the mines have been worked with the utmost energy in the interests of the Central Powers, under the management of

Austrian and German engineers. The deposits are so extensive that a speedy exhaustion is not to be feared. The ore contains from 6 to 9 per cent. of copper. Previous to the war, works for smelting the ore were erected mainly by French capital. Other deposits, less rich in metal, but not yet worked on, exist. With improved means of transport Serbia may yet become an important source of copper.—(*Deutsche Bergwerks-Zeitung, Metall u. Erz, May* 8, 1918.)

Germany's Chief Home Source of Copper.—Germany's chief home source of copper has hitherto been the mines of the Mansfeld district. These mines are being worked by thirty-two federated companies. At a general meeting recently held, important extensions of the works were proposed. The central governing body announced that since the beginning of 1918 large concessions of copper-bearing land have been acquired at a moderate cost in different parts of the country, namely, at Stolberg, in the Hartz, in the neighbourhood of Nordhausen, and at Köthen, in Anhalt. Thus, provision is being made for future demands.—(*Metall u. Erz, May* 8, 1918.)

Phosphate Deposits of New Guinea.—The loss to Germany of New Guinea may be partly expressed in the value of phosphates. The colony was a source of phosphates of great value to the home agricultural industry. The output of the deposits was increasing year by year, and reached a total of 60,000 tons in the year before the war. Two large companies, the Pacific Phosphate Company and the German Südseephosphat A.-G., dealt with the whole output, about a third of which was shipped to Germany, Australia taking another third. The loss to German agriculture is severely felt.—(*Chem. u. Tech. Zeit., April* 1 *and* 15, 1918.)

German Metal Research Institute.—Following closely on the founding of the Kaiser Wilhelm Institute for Research in Iron and its Ores, comes the announcement that preliminary steps have already been taken to found a similar institute for research in the non-ferrous metals. A commission, composed of eminent engineers and university professors, has been formed to consider plans for the establishment of a metal research institute for the benefit of German metallurgical industries.—(*Metall u. Erz, May* 8, 1918.)

German Requirements in the Rarer Metals.—At a recent meeting of the German Iron Masters, Dr. P. Krusch surveyed the prospects of obtaining certain metals required in the steel industry and reached the following conclusions. The home supply of nickel is derived solely from Frankenstein, Sohland, and Schneeberg, and, being limited to a few hundred tons with no prospect of increased output, constitutes only a fraction of the normal requirements of Germany. Chromium must be obtained exclusively from outside Germany. Tungsten ore is obtained from Saxony, but the amount available is much less than is required, and the balance must be purchased abroad. Native molybdenum is used extensively at the present time, being chiefly obtained from Mansfeld, Hoellenthal, and Richelsdorf. These sources can supply all that is likely to be required for many years to come. Vanadium is also available in quantities which are more than sufficient for all requirements. About half the iron likely to be required is available in native ores. Minerals containing manganese are available, but are not suitable for extracting this metal, so that it will have to be obtained from other countries

Dr. Krusch suggested that after the conclusion of the war the required materials should be obtained as follows: The iron would be brought chiefly from France, whose reserves are three times those of Germany; manganese would be obtained from Russia and Brazil, nickel from Canada and New Caledonia, chromium from Asia Minor, tungsten from Spain and Portugal. "The possibility," he said, "of our future requirements being covered by the Peace Negotiations is assured, and it only remains for us to find the best means of ensuring the supply of ores."—(*Metall u. Erz, May* 8, 1918.)

Utilisation of Reclaimed Rubber in Germany.—At the 24th general meeting of the German Bunsen Society (for applied physical chemistry) held in Berlin on April 8—10, 1918, Prof. M. Le Blanc of Leipsic exhibited specimens of a reclaimed rubber named "Agatit," the process of manufacture of which was worked out by him in collaboration with Dr. Lüttke. The material is being made in large quantities both in the solid form and as a fine emulsion. Its use is specified by the Reichsmarineamt in place of natural rubber for the preparation of sheeting and high-pressure packing material such as is used in submarine construction. It is also used as a substitute for leather; it can be nailed or sewn, it withstands sterilisation well, and the difficulty of rapid ageing has been overcome. Such articles as operating gloves (2 mk. 50), finger stalls, and teats (0·25 mk.) are on the market.—(*Chem.-Zeit., April* 17, 1918.)

Saponiferous Plants as Soap Substitutes in Germany.—In view of the shortage of fats, attention in Germany is being directed to the use of the natural soap substitutes occurring in certain plants. Thus, the soapwort (*Saponaria officinalis*) contains large quantities of saponin, a fact which can easily be demonstrated by rubbing the leaves or stem in water when a thick soap lather is readily produced. The root is the part of the plant richest in saponin. After digging up, it is thoroughly washed, dried and reduced to as fine a powder as possible. It can then be used directly with water in the same way as soap, both alone for the hands, and in conjunction with soda for linen. The substance is an excellent detergent with good lathering properties.

A number of other plants can be used for the same purpose, although their saponin content is lower than that of the soapwort. These include the "meadow campion," or "ragged robin" (*Lychnis Flos-Cuculi*), the "bachelor's button" *Melyandrum*), the "flaxweed" (probably *Silene inflatus* or *Silene natans*), the "bladder campion," the "corn-cockle" (*Agrostemma Githago*) and the "burst" or "rupture wort" (*Herniaria glabra*). All these are common plants, easily gathered, and in many cases can entirely supplant the costly substance, soap.—(*Seifenfabrikant*, 1918, **37**, 374.)

Mineral Wealth of Turkey.—New sources of mineral wealth are to be found in European Turkey. Copper-ore in abundance exists in Turkish Rhodope in the neighbourhood of Yardimli. In the Turkish Balkans, ores of nearly all the metals are to be found. There is gold in Markova Reka, south of Uskub. In the country about Kratova gold and rich galena holding a good percentage of silver have been discovered. Chromium-ore in abundance is found in the neighbourhood of Niausta, on the Salonika-Monastir railway. The hitherto little known mountain range of Southern Macedonia is especially rich in chromium-ore. There are also iron, antimony, and lead ores. To the north-west of Salonika, at Rodzen, antimony deposits have been worked for years past.—(*Metall u. Erz, May* 8, 1918.)

A Sugar Industry for Turkey.—Energetic preparations are being made by the Turkish Government to create a sugar industry. All land within the Turkish Empire, suitable for beet or cane cultivation, has been divided into 40 zones, of which 30, situated in Asia Minor, are best suited for beet. In general, beet cultivation is to be

preferred, because even those districts best suited for cane yield a product containing less sugar than canes imported from abroad.—(*Chem.-Zeit., May* 8, 1918.)

German Sugar Production.—The *Kölnische Zeitung* gives statistics for 202 sugar factories. From these figures it is estimated that the 319 factories in operation during 1917 consumed 17,500,000 tons of sugar beet, which with a minimum yield of 16½% would produce nearly 3,000,000 tons of raw sugar. The corresponding consumption of sugar beet in Germany for the two previous years was 28,000,000 tons in 1915; and 18,000,000 in 1916.—(*U.S. Com. Rep., May* 21, 1918.)

Tin and Wolfram in Siamese Malay.—The exports of tin (ores?) for the year ended March, 1917, amounted to 8765 tons, a slight decrease on the preceding year's figure. About one third of the output was obtained by dredging. The amount of tin ore contained in the excavated material varied from 0·58 to 1·16 lb. per cubic yard. All the ore is shipped to the smelting works in the British Malay States, and in consequence Siam has to import tin from outside sources to meet the home demand; in 1917, 984 tons of rough tin was so imported.

The price of tin has increased enormously although the world production has not altered much; thus in 1914 the total output was 116,508 tons and the London price £152 per ton, in 1917 the corresponding figures were 119,461 tons, and a price as high as £290 per ton.

It is expected that the vast mineral resources of the interior of Siamese Malay will shortly be developed, the country is being opened up by the new railway, and is being carefully prospected.

The wolfram exports for 1917 amounted to 522 tons against 424 tons for the previous year. The greater part of the production is shipped to Singapore.—(*U.S. Com. Rep., May* 1, 1918.)

Camphor Production in China.—According to H.M. Commercial Attaché at Shanghai, the production of camphor in China has fallen to a very low figure, and there is little prospect of any increase for many years. The "Encyclopædia Sinica" states that in 1891 nearly 17,000 piculs (picul = 133⅓ lb.) was exported, but after the cession of Formosa to Japan the trade passed into Japanese hands. Traders then sought for camphor supplies in Fukien, where the trees grew in abundance. High profits led to a reckless exploitation of the industry, and in 1906 there were 20 distilleries in Foochow, and over 11,000 piculs was exported. When all the available trees were cut down the industry died out. Some success has attended the efforts made to develop the industry in Kiangsi in South Hupei. The export from China in 1916 was 2377 piculs, valued at 181,673 taels (tael = 4*s.* 9*d.* approx.). Of this quantity 1686 piculs went to Hong Kong, 537 to the U.S.A., and 100 to British India. The industry might be revived and developed to a great extent if State support were forthcoming. In the Shan States of South-West Yunnan there are immense numbers of camphor trees awaiting development and better transportation facilities.—(*Bd. of Trade J., June* 20, 1918.)

Zinc Industry in Japan.—Until 1899 no zinc ore was treated in Japan, although a little was exported as such. In that year the Kosaka mine installed a wet process for the production of metallic zinc from its black ore, but the project met with no financial success. In 1909 the same company again started to produce zinc, both by wet and dry methods. The wet method proved very successful, and the output reached 10,000 lb. per month. Other firms followed suit, using both methods, and the output of metallic zinc in 1914 rose to 5800 tons. The outbreak of war completely changed the aspect of the zinc market all over the world, and a tremendous growth took place in the Japanese industry. New plants were erected and old ones extended, so that the annual output has now reached 40,000 tons, of which 25,000 tons is exported. Within a few years a production of 100,000 tons is expected. Such an output will entail a new supply of zinc ore. At present the Kamioka and Siberian ores are chiefly used. The present consumption is at the rate of 160,000 tons a year, but it is expected that this will rise to 350,000 tons, while the domestic production was only 39,000 tons in 1915 and 50,360 tons in 1916. It is expected that new supplies will be obtained from Australia, China, Siberia, and India. The table shows the approximate value of zinc ore produced both as ore and as metal, as well as that exported.

Year.	Production.	Exported.
1905	£24,900	—
1910	£77,000	£60,000
1915	ore £228,500 zinc £395,000	£36,000 £399,000
1916	ore — zinc —	£18,300 £1,925,000

(*The Chem. Technol., March*, 1918.)

Dutch Coal Supplies.—The coal mining industry of Holland developed with remarkable rapidity in the first fifteen years of the present century, and the tendency to further growth continues in undiminished proportion. The average annual increase since 1914 has been about 16½ per cent. The number of mines working increased from four in 1906 to eight in 1916. An official report made in 1910 estimated the future output at 4 million tons in 1925, 6 million tons in 1935, 6½ million tons in 1945, and over 8¼ million tons in 1950.—(*Coll. Guard., June* 21, 1918.)

Gas from Wood and Peat.—The great shortage of coal in Switzerland is leading to the distillation of a very considerable tonnage of wood and peat for gas making. In order to remove much of the carbon dioxide in the gas produced by such distillation, a process suggested by M. Demolis is now being developed. The process consists in passing the raw gas over incandescent wood charcoal; the carbon dioxide being thus converted into carbon monoxide, while the acetic acid present in the gas is decomposed. A better wood tar is also said to be obtained. The process is in actual use in works possessing vertical retorts. Swiss gas makers are seeking to organise means for the cutting of timber for gas making and for the working of peat deposits. In some cases it is proposed to enrich the gas with acetylene.—(*Gas J., June* 18, 1918.)

American Fuel Shortage.—The American fuel famine is discussed at length in the American Museum Journal for February, by C. Berkey and C. van Hise. The shortage of coal is acute, and has demanded drastic legislation to control consumption. The shortage is due entirely to the unprecedented demands of the industries dependent upon coal, and to difficulties of transport. The shortage is in no way due to any precautionary measures engendered by fear of exhausting the mines, for careful estimates show that even at the present enormous rate of consumption the mines of the United States will continue to yield for

something like two thousand years. The anthracite reserves, however, are being depleted at a much faster rate than the bituminous coals, and will probably not last more than a hundred years. The rate of production of bituminous coals at the present time in the United States is about 600,000,000 tons per annum.—(*Nature, June* 20, 1918.)

TREATMENT OF OIL SHALE IN COLORADO.—As a result of laboratory tests on Colorado shale, the American Shale Refining Co., of Denver, Colo., has undertaken the production and refining of shale oil on a commercial scale, a retort furnace capable of treating 150 tons of shale per day being in course of erection. The furnace consists of four circular combustion chambers and four retort chambers, arranged alternately, forming a cylinder approximately 30 ft. high and 12 ft. in diameter. The crushed shale is fed automatically from two steel tanks on to a revolving table in the top retort chamber. Each retort chamber contains a similar table, and the shale is finally drawn off by screw conveyors at the bottom. The temperature of each combustion chamber can be regulated, and it is estimated that 95 per cent. of the valuable constituents can be recovered. The furnace is worked under vacuum, the gases being drawn off by a vacuum pump into water-cooled condensers.—(*Eng. and Min. J., May* 8, 1918.)

PRODUCTION OF POTASH IN CHILE.—A Chilean chemical engineer states that the nitrate mined by 37 "oficinas" contains an average of 1·73 per cent. of available potash, and therefore over 300,000 tons of potash could be recovered from the total annual production of 3 million tons. The most successful process of extraction is stated to be one which involves the use of refrigeration, the cost of extraction being given as 20—30 centavos ($2\frac{1}{2}$*d*.—4*d*.) per kilo.—(*U.S. Com. Rep., May* 2, 1918.)

CHILEAN NITRATE.—The production of nitrate of soda during the first six months of the current year was 31,637,884 quintals, against 32,131,713 quintals in 1917. The exports from Chile during the same periods were:—

	1918. Tons.	1917. Tons.
Europe and Egypt ...	532,871	547,555
United States	759,772	595,405
Other countries	53,866	68,567
	1,346,509	1,211,527

At June 30, 1918, stocks in Chile amounted to 986,000 tons (unverified stock—allowance for "merma" not yet ascertained), as against 921,500 (verified stock) last year.

A NEW SOURCE OF ALCOHOL IN MEXICO.—A plant called "Sotol," which grows abundantly in Northern Mexico and Western Texas, is to be used for the production of alcohol at Ciudad Juarez, Mexico. The cost of collecting the plant is given as \$2—\$5 per ton, and the yield of alcohol, 18—25 gallons of 180 proof from 1 ton. The local plant is expected to produce 250 galls. daily when working at full capacity.—(*U.S. Com. Rep., May* 2, 1918.)

SKINS AND HIDES IN VENEZUELA.—There are considerable quantities of skins and hides not yet under Government control in Venezuela. Besides ox-hides, there are also deer, alligator and jaguar hides to be considered and under present conditions, at any rate, the millions of chiguire or carpincho in the Orinoco valley are not to be despised. The latter is a large rodent with a thick skin about $1\frac{1}{4} \times 1$ m. and a coarse brown fur. Its leather can be worked well and should interest European importers.—(*Rev. Suisse d'Export., Feb.* 23, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Enemy Subjects (Patents).

Answering Sir E. Carson, Sir A. Stanley announced that 1310 applications for the grant of patents have been received from enemy subjects since the outbreak of war, of which 944 have been accepted. (July 8.)

China Clay Industry and Man Power.

In reply to a number of questions put by Mr. Duncan and Sir Francis Layland-Barratt, Sir A. Geddes said: A committee appointed by the National Council of the China Clay and China Stone Industries was interviewed by the Parliamentary Secretary to the Ministry of National Service on May 29, when the Decertification Order and the general man-power position of the industry were fully discussed. The Committee asked for an assurance, which was readily given, that further Orders affecting the industry would not be made without consultation with the new council. I am asking the Director of National Service for the South-Western Region to arrange for an early meeting with the National Council of the china clay industry, in order that it may have a full opportunity of putting forward its views. I am always most desirous of consulting the National Councils, as they are established on questions of general policy in relation to the industries which they represent. (July 9.)

Indian Hide Trade.

The Secretary of State for India (Mr. Montagu), in response to an inquiry by Mr. Rowlands, said that before the war the East India export trade in raw hides was largely controlled by the Calcutta Hide Trade Association which worked with a Hamburg association, and by its methods virtually obtained a monopoly. The Calcutta Association consisted of seven firms, of which five have been wound up under the Enemy Trading Act, while from the remaining two enemy interests have been completely eliminated. The export trade in raw hides is now controlled by the Government of India which purchases the exportable surplus of certain classes. None of the purchasing agents is of enemy origin, and they do not, in any sense, enjoy a monopoly of such trade. The measures already adopted have done much to divert this trade to British and Indian merchants, and there is every reason to think that the enemy control of this important trade has been permanently eliminated. (July 10.)

Holzapfels, Ltd.

Sir A. Stanley informed Mr. Pennefather that of the 24 per cent. of the share capital in Messrs. Holzapfels, Ltd., held on October 18, 1916, by two naturalised British subjects of enemy birth, 89,856 shares, formerly belonging to Max Holzapfel, were transferred to persons unconnected with his family; and of the 22,410 shares belonging to A. C. A. Holzapfel, 17,885 were transferred to his children and to his son-in-law. The name Holzapfel has been changed to Ward.

In reply to the same member, Mr. Kellaway stated that in 1917 this firm were granted the usual stock permits enabling them to order ingredients for paints and compositions for fishing vessels, trawlers, and ships' bottoms, and also the usual repair and maintenance permit for spare and repair parts. These permits were arranged in consultation with the Admiralty, subject to the supervision of the Board of Trade surveyors. Dr.

Macnamara, replying for the Admiralty, said that there was no record of any permit being issued to this firm between June 1, 1917, and March 31, 1918. Business relations with the company were suspended in July, 1917, but were resumed subsequently on the assurance of the Board of Trade that enemy interests had been practically eliminated. (July 15.)

Wood Pulp (Shipping Facilities.)

The Parliamentary Secretary to the Ministry of Shipping informed Sir Arthur Fell that the Shipping Controller could not, at present, take steps to provide tonnage to convey wood pulp from Canada in order to save the extra expense of obtaining the material in Scandinavia, nor could he give financial assistance to the Ha Ha Bay Sulphite Co., in Canada. The requisition of the ship belonging to that company was in no way a breach of any promise. This company has been treated in exactly the same way as another important British enterprise, whose wood pulp and paper had regretfully to be refused transport, and whose special ships had to be requisitioned. (July 15.)

Kellner-Partington Wood Pulp Company.

Replying to Sir J. Butcher, Lord R. Cecil stated that it was substantially correct that the large industrial works at Barrow belonging to this company are entirely under the control of foreigners who bought up all the shares. So far as he could discover, but little progress had been made in the negotiations for the re-sale of these works. Certain allegations as to the exportation to Germany of products from the company's Swedish works are under investigation, but the most recent information tends to show that the export was to Switzerland, and not to Germany.

In answer to Colonel W. Thorne, Lord R. Cecil said that it was substantially correct that the company (which is still an English one with registered offices at Newmarket Lane, Manchester) had entered into a partnership with the Austrian Government for the working of factories at Hallein and Hillach; and that a company is to be formed in which the Austrian company will hold a two-thirds interest, and the Kilner-Partington company one-third. In February last the Austrian Government, which had requisitioned the factories in 1914, threatened to sell them up, and H.M. Government therefore authorised certain Norwegian interests to negotiate for the sale of the factories. It was agreed that the purchase price should be 13,250,000 crowns, payable as to 9,250,000 crowns by the Austrian Government, and the remainder by a new Austrian company, one year after the end of the war. (July 16.)

Gas Residuals.

Sir L. Worthington-Evans stated that the Government is prepared to buy certain of the products obtained from gas residuals. Among the prices (per gallon) offered are: 3*s.* 4½*d.* for toluene; 10¾*d.*—1*s.* 0½*d.* for standard benzol; 1*s.* 6*d.*—1*s.* 7*d.* for pure benzol. Creasote, from 75*s.* to 103*s.* per ton. Buying and selling in the open market is prohibited. (July 18.)

Remuneration of Scientific Workers.

Sir William Beale asked the President of the Board of Trade if scientific men, who were members of the councils or boards of management of Industrial Research Associations, could receive remuneration for their services other than out-of-pocket expenses. Sir A. Stanley, in reply, said that in dealing with applications for licences under the provisions of Section 20 of the Companies Consolidation Act, 1908, due provision is made for the payment of reasonable remuneration to members of such councils, with the approval of the Department of Scientific and Industrial Research. (July 18.)

State Aid for the Dye Industry.

A White Paper was issued on July 18 containing a supplementary estimate for the Board of Trade of £1,000,000 for assistance to the dye-making industry. This is the first instalment of a total sum of £2,000,000, the expenditure of which is to be spread over three years.

LEGAL INTELLIGENCE.

EXCESS PROFITS DUTY. *The Commissioners of Inland Revenue v. W. Ransom and Son, Ltd.*

Before Mr. Justice Sankey in the King's Bench Division on June 25, the Commissioners of Inland Revenue for Hitchin, Herts, stated a special case for the opinion of his Lordship in the case of The Commissioners of Inland Revenue *v.* William Ransom and Son, Ltd., under the Finance Act (No. 2), 1915, Section 45 (5). They stated that W. Ransom and Son, Ltd., of Hitchin, appealed before them against an assessment of £531 for the year to December 31, 1914, in respect of excess profits duty. Ransom and Son, Ltd., owned freehold works and premises at Hitchin, where the distillation and other treatment of herbs, etc., was carried on, and also a farm where the herbs were grown. The company's accounts made no distinction between the results of growing the herbs on the farm and the results of their distillation and sale. In computing the profits of the respondent company for the purpose of ascertaining its liability to income tax under schedule "D" of the Finance Acts, the profits were viewed as a whole, and a deduction of £22 17*s.* was made for the occupation of the farm under cultivation for 1914-15. The respondent company claimed to exclude the profits arising from the cultivation of the farm on the ground that they were derived from husbandry—a business separate from the manufacture of chemicals and drugs. The Crown contention was that it was one business and that there was no authority in the Finance Act (No. 2), 1915, for the division of one business into parts. It was agreed on a revision of the figures that the assessment should be reduced to £240, and it was admitted that if the respondent company was successful in its appeal the assessment should be further reduced to £75. The Hitchin Commissioners found as a fact that the respondent company occupied the farm in connexion with and mainly for the purpose of the factory in which the herbs grown on the farm were distilled. The Commissioners were nevertheless of the opinion that the farm occupation was a business of husbandry and should be excluded in the computation of the respondent company's profits for excess profits duty. They accordingly reduced the assessment to £75.

Sir F. Smith, Attorney General, and Mr. Parr appeared for the Inland Revenue Commissioners who appealed from the decision of the Hitchin Commissioners; and Messrs. Finlay and Latter appeared for W. Ransom and Son, Ltd.

After hearing counsel's arguments his Lordship gave judgment, in the course of which he said that the term husbandry had a very wide signification. He was not prepared—as this was a new Act and other cases might fall to be determined—to lay down that a man who tilled the soil was in all circumstances a husbandman or engaged in husbandry. But in this particular case he could see no distinction between a man who tilled the soil for the purpose of producing food for human consumption and a man who tilled the soil for the

purpose of producing medicine and drugs also for human consumption, and possibly to rectify or correct the evil which food had produced on persons—perhaps not in these days—who had taken too much of it. He thought that respondents were engaged in tilling the soil and producing from it commodities for human consumption. As to the point raised by the Attorney General regarding public policy in exempting husbandry in order to increase the food production of the country his Lordship thought at this time it was equally public policy to remember that drugs were of primary importance. On that point he did not think he was entitled to interfere with the decision of the Hitchin Commissioners. The Crown's second point was that if the growing of herbs to use in the factory was husbandry, the main and substantial business of the company was the manufacture of drugs; they were manufacturing chemists and there was no authority to say that they were entitled to split up a business and say that in respect of one portion they would escape liability. His Lordship held that where it was possible—as it seemed to be in this case—to divide the businesses, they should be separated, and he found that the one so separated came within the exception in the Act. He had come to the conclusion that the Hitchin Commissioners were right and that respondents were entitled to judgment with costs.

Cream of Tartar Contract Case. *Fuerst Bros., Ltd., v. Fabbrica Chimica Ovenella.*

Before the Court of Appeal, composed of Lords Justices Pickford, Bankes, and Scrutton, on July 1, the case was heard of Fuerst Bros., Ltd., of 17, Philpot Lane, E.C., and the Fabbrica Chimica Ovenella à Società Anonima, of Palermo, which related to contracts of April 30 and July 2, 1917, for the sale by the defendant society to the plaintiffs of 20 tons and 30 tons of white powdered cream of tartar, 99—100 per cent. The appeal was by Messrs. Fuerst Bros. against an order made by Mr. Justice Rowlatt, setting aside an order by Mr. Justice Coleridge, by which leave was given to the plaintiffs to be at liberty to issue writ of summons against the defendants and serve at Palermo.

Mr. Schwabe, in opening the case for the appellants, stated that this was a cost and freight contract, and there had been a breach by the defendant sellers. Under the first contract a shipment of 10 tons was made. It was provided that the cash should be paid by the plaintiffs against the presentation of documents by the defendants in London. These were duly presented in respect of the 10 tons, but as to the other 40, the defendants had failed to present the documents. The plaintiffs were always willing to pay against the presentation of such documents.

Mr. R. A. Wright, for the sellers, contended that the only breach was the non-shipment. The fact as to payment being by cash against documents was only a provision for the carrying out of the contract, assuming that it had not been broken.

Lord Justice Pickford, in delivering judgment, said he was of opinion that the original order of Mr. Justice Coleridge was correct. The breach of the contract was the non-presentation of documents in London. According to the course of business sworn to, the seller who was shipping the goods at Palermo had to notify the buyers of the name of the ship so that the buyers could effect the insurances, and the seller had still got to present documents in London. That obligation remained the same here as if it was a c.i.f. contract. The attitude of the foreign seller was: "I did not ship and I did not notify the buyers that I had shipped, and therefore they could not effect the insurances. I committed a breach in Italy, and therefore there is no breach in England." He would not stop to consider if the first item in this proposition was correct, but as to the second that, as there was a breach in Italy, therefore there was no breach in England, that was an entire *non-sequitur*. The obligation still remained to present documents in England. He was of opinion that that part of the contract had to be performed in England, and the order of Mr. Justice Coleridge was correct. The appeal of the plaintiffs would therefore be allowed with costs. Lords Justices Bankes and Scrutton concurred.

Claim for Cost of Re-erecting a Retort. *Sir T. Brooke-Hitching v. Sir C. Clifford Sifton and Messrs. Harding Bros.*

Mr. Verey, sitting in the Official Referee's Court on June 12, heard a claim by the plaintiff for the sum of £1375 for the cost of re-erecting a Bryson retort, situate on his works at Hunt End, Redditch, for the use of which for some experiments on the distillation of oil from coal and shale the defendants had agreed to pay £200, with the option to purchase the plant for £1500 if the experiments were successful. Plaintiff also claimed damages for use and conversion. The retort contained a Del Monte coil, intended to effect the distillation at 400°—800° C.

Sir C. Clifford Sifton denied waste or that he used the plant for an unreasonable time, and submitted that the claim was unreasonable and excessive, and that he was not liable for the reinstatement of the plant, but paid £200 into Court as sufficient to meet the claim. Messrs. Harding Bros. represented that they were acting as agents for Sir C. C. Sifton, and, denying any obligation to restore the plant, submitted that it was left in better condition than when they took it.

Mr. Verey, in giving judgment on July 5, said that the option to purchase was not exercised. The true measure of the damages was that which applied as between landlord and tenant, *viz.*, the cost of reinstating. He found that the cost of pulling down and re-building the retort and reinstating the plant (in July, 1917) would have been £1100; that the plaintiff was entitled to recover £50 for loss of use of the premises for the six months needed for this work, and £40 for the time by which the defendants had unreasonably prolonged the experiments, making a total sum of £1190, for which he entered judgment for the plaintiff with costs. Harding Bros., not having been proved to be jointly interested or to be acting otherwise than as agents for Sir C. C. Sifton, were entitled to judgment on the issues as to their being liable under the contract, but their position was so ambiguous that he did not allow them their costs on these issues. He entered judgment, however, for the plaintiff against Harding Bros., on the issue as to conversion of the plaintiff's goods, for £50 and costs.

Cleansing of Blast Furnace Gases.—In the Patents Courts on July 4, the Comptroller of Patents heard the application of James Keith and Blackman, Ltd., of Farringdon Avenue, E.C., and of Arbroath, for a licence to use patents Nos. 22433/1910, 27696/1911, and 13892/1913. The patentee was Hans E. Theisen, and the patents related to the washing and purifying of blast furnace gases for subsequent use for gas engines and steam boiler heating. Counsel for the applicants stated that the apparatus was the best that had been devised, and that many plants had been used successfully in Germany. The Comptroller said that the Board of Trade would be recommended to grant the licence.

GOVERNMENT ORDERS AND NOTICES

FORMALDEHYDE (DEALINGS) ORDER, 1918.

The Army Council, under date July 8, has issued the following Order:—

1. No person shall purchase, sell or make, or take delivery of or payment for any formaldehyde (40 per cent. solution) at any price other than £150 per barrel delivered free on rail; provided that upon any sale of any quantity exceeding ten gallons and not exceeding one barrel an addition of 7*d*. per lb. may be made; and provided that upon any sale of any quantity exceeding five gallons and not exceeding ten gallons an addition of 7½*d*. per lb. may be made; and provided that upon any sale of any quantity not exceeding five gallons an addition of 8*d*. per lb. may be made; and provided further that upon any sale of any quantity less than one barrel additional charges may be added to the sale price in respect of carriage and containers, such charges to be limited to any expenses actually incurred by the vendor, subject to an addition of 1*d*. per container in the case of containers holding less than one-half gallon.

2. This Order may be cited as the Formaldehyde (Dealings) Order, 1918.

TRADING WITH THE ENEMY.

Fees and Agents' Charges in respect of Patents, Designs and Trade Marks.

Whereas by a Licence dated 7th day of December, 1915, the Board of Trade, in pursuance of the powers conferred upon them by certain Royal Proclamations relating to trading with the enemy, authorised all persons in the United Kingdom or in any part of His Majesty's Dominions to pay any fees necessary for obtaining the grant, registration or renewal of Patents, Designs or Trade Marks in an enemy country and to pay to enemy agents their charges and expenses in relation to such matters and also to pay on behalf of an enemy fees payable in the United Kingdom or in His Majesty's Dominions on applications for the grant, registration or renewal of Patents, Designs or Trade Marks and to pay the charges and expenses of agents in relation thereto;

And whereas the said Licence was amended by a further Licence of the Board of Trade dated 5th September, 1917;

And whereas it appears to the Board of Trade that such payments as aforesaid should no longer be authorised;

Now, therefore, the Board of Trade hereby revoke the said Licences and give notice that all such payments as aforesaid are from the date hereof prohibited under the Proclamations relating to Trading with the Enemy.

H. Llewellyn Smith,
A Secretary to the Board of Trade.

July 15, 1918.

OTHER ORDERS.

Kips and Calf Skins (Great Britain) Amendment Order, 1918. Army Council, July 2.

Sole Leather (Mineral Tanned) Order, 1918. Army Council, July 4.

Coal (Pit's Mouth) Prices No. 2 Order, 1918. Board of Trade, July 5.

The Coal Mines (War Wage Payment) Directions, 1918. Board of Trade, July 5.

Gold Thread Order, 1918. Board of Trade, July 9.

Timber Control Order, 1918. Board of Trade, July 16.

Release of Cement.—The Secretary of the War Office announces that permits for the release of cement will be issued by the Director of Army Priority (D.A.P.3.C) Caxton House, Tothill Street, London, S.W. 1.

PROHIBITED EXPORTS.

An Order of Council, dated July 2, further amends the list of articles of which the export is prohibited, as follows:—

(1) *That the following headings should be deleted:—*

(C) Bone black; (B) Capsicum; (A) Capsicum, oleo-resin of; (C) Aloe juice; (C) Iron, oxides of; (B) Fenugreek seed; (C) Paper coated with gelatine; (C) Paper, Japanese tissue and similar cellulose paper; (A) Paraffin wax; (B) Wood tar; (C) Vanillin, vanilla and vanilla pods.

(2) *That the following headings should be added:—*

(A) Capsicum, including oleo-resin of capsicum; (A) Iron, oxides of, and mixtures containing iron oxides; (A) Diatomite or infusorial earth; (A) Fenugreek seed; (B) Paper and cardboard (including strawboard, pasteboard, millboard, and wood-pulp-board) and manufactures of paper and cardboard, not otherwise specifically prohibited; (A) Paraffin wax, and mixtures and preparations thereof containing 20 per cent. and upwards of paraffin wax, but not including waxed paper; (A) Siennas; (A) Wood tar; (A) Umber; (A) Vanillin, vanilla and vanilla pods.

CHEMICAL FERTILISERS IN 1917.

During the past few years the demand for chemical fertilisers has increased greatly, and has now considerably outrun the supply. A summary of international trade in fertilisers, recently issued by the International Institute of Agriculture in Rome,* deals with three groups of fertilisers, phosphatic, potassic and nitrogenous, in the three-fold aspect of production, trade and prices, while statistics are also given for other chemical products used in agriculture. The quantities throughout are stated in metric tons.

Phosphatic Fertilisers. The world's production of rock phosphates suffered a great reduction in 1915, and fell still further in 1916. Even though America was not then taking part in the war, her production declined from 3,161,146 tons in 1913 to 1,865,123 in 1915, and increased only slightly in 1916 when it reached 2,014,196 tons. In Egypt and in Algeria a similar but larger recovery occurred in 1916, the figures for Egypt being 125,008 tons in 1916 against 82,998 in 1915 and 104,450 in 1913; and for Algeria 380,211, 225,871, and 461,030 tons in the same three years. A small recovery was also recorded for Tunis. In all cases the greatest decline took place in the first year of the war.

As regards the trade in phosphates, the aggregate shipments for all American phosphates were 671,620 tons in 1917 against 710,758 in 1916, while from Tunis the shipments during 1917 were only about 60 per cent. of those in 1916, and less than 33 per cent. of those in 1913. International trade in basic slag and in superphosphate of lime is at a minimum. The production of basic slag in England is larger than it was before the war, amounting to 575,000 tons in 1917, but the slag is of low content, while in Germany 2,090,000 tons of slag was obtained during 1916, and of a quality said to be similar to that of peace-time.

* The International Movement of Fertilisers and Chemical Products Useful to Agriculture. No. 8, May, 1918. (Rome: The International Institute of Agriculture.)

In all countries the production of superphosphate of lime is greatly decreasing not only because of the difficulty of transport of the raw phosphate, but also because sulphuric acid is now only delivered to the makers in limited quantities. In Great Britain the production of superphosphate in 1917 was 495,000 tons against 631,000 tons in 1916. France, Italy and Spain all show similar decreases; Japan alone has increased its superphosphate exports.

Potassic Fertilisers. In France the production of potash salts for this year will barely reach 5000 tons, whereas the pre-war annual requirements were estimated at 90,000 tons. In England the maximum production of potash for 1917-18 will be 15,000 tons. Before the war England imported the equivalent of 23,000 tons of potash from Germany.

A remarkable development of the potash fertiliser industry has taken place in the United States, where more potash was produced during the first six months of 1917 than was produced throughout 1916.

There is very little international trade in potassic fertilisers, Sweden and Austria being the only countries which have imported these products. British India has exported more saltpetre in each year of the war, 26,000 tons in 1917 against 15,000 in 1913, while imports of this product into Great Britain have risen correspondingly.

Sulphate and chloride of potassium have everywhere advanced greatly in price, while German salts of potash are no longer quoted on any markets except those of the producing country.

Nitrogenous Fertilisers. For the last eighteen months the production of Chilean nitrate has recovered to the peace-time level—3,011,810 tons in 1917 against 2,773,552 in 1913, after falling to 1,770,000 in 1915. Stocks on the Chilean coast in 1917 were 882,556 tons against 480,129 in 1913, due to the increased difficulty and cost of transport, while the production was still continuing. Shipments in 1917 were considerably larger than in 1914 and 1915, but 204,534 tons less than in 1916. Europe and Egypt received 513,673 tons less in 1917 than in 1916, while the United States record a largely increased import.

In Germany the production of sulphate of ammonia (really ammonium nitrate) has greatly increased since 1914, and reached 700,000 tons in 1917, while in France the declared production for 1917 was 34,000 tons, Italy 9000 tons, United States 400,000 tons, Japan 50,000 tons, and Great Britain 250,000 tons. This estimate of the British production is much lower than that of peace-time—438,932 tons in 1913, but on the other hand the export has been reduced by 266,000 tons so that there still remain considerable supplies available for home agriculture.

An enormous increase has occurred in the manufacture of synthetic nitrogenous materials. The annual capacity of the calcium cyanamide factories is 1,321,000 tons and their present output is 886,000 tons compared with 156,944 tons in 1913.

Prices for sulphate of ammonia have everywhere advanced.

Chemical Products used in Agriculture. The sulphur production in Italy has greatly decreased, while the consumption of sulphur in the United States was three times larger in 1916 than in 1913.

The production of sulphate of copper in France was nearly twice as great in 1917 as in 1913. The trade generally has been greatly hindered by the war. British exports, which in 1913 were 77,000 tons, were only 48,000 in 1917. American exports, however, have increased from 2000 tons in 1913 to 13,000 tons in 1917. The prices of both sulphate of copper and sulphur advanced everywhere during 1917.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, July 4, 11, and 18.)

OPENINGS FOR BRITISH TRADE.

H.M. Trade Commissioner in Australia reports that firms in Melbourne desire agencies for cocoa-butter, tanners' chemicals, glassware, iron and steel plates, etc. [Ref. Nos. 160/17, 160/18, 177.]

A firm at Bulawayo desires sole agency for U.K. manufacturers of liquid disinfectants, preferably a tar derivative. [Ref. No. 186.]

A firm in Montreal desires agencies for U.K. manufacturers of chemicals, etc. Particulars may be had on application to the High Commissioner for Canada, 19 Victoria Street, S.W. 1.

A firm at Barcelona desires agency for U.K. manufacturers of pharmaceutical products. [Ref. No. 187.]

An agent at Malaga, Spain, able to export cork, desires agencies for fertilisers.

An importer at Trujillo, Peru, desires agencies for U.K. manufacturers of chemicals, drugs, etc. [Ref. No. 174.]

A firm at Barquisimeto, Venezuela, would be glad to get into touch with U.K. importers of castor-oil beans. [Ref. No. 175.]

A firm at Caracas, Venezuela, desires agencies for U.K. manufacturers of, *inter alia*, medicines and drugs. [Ref. No. 199.]

H.M. Commercial Attaché at Buenos Aires reports that the local authorities are advertising for tenders, to be presented by November 8, for supplies for a period of ten years of sulphuric acid for clarification of water supply, and for the construction of a sulphuric acid factory.

TARIFF. CUSTOMS. EXCISE.

Argentina.—The Bd. of Trade J., July 11, gives the modifications in the export duties for the month of July. Articles affected include fat and tallow, hides and skins, etc.

Australia.—The importation of kerosene, petrol, benzine, turpentine and turpentine substitute in tins which bear brands or distinguishing marks is prohibited as from April 5, without the previous consent of the Minister for Trade and Customs. The proclamation of December 5, 1917, is revoked.

British India.—A new list of prohibited exports is given in full in the Bd. of Trade J., July 11. The list includes many chemicals, drugs, dyes, oils and oil seeds, hides and tanning materials, etc.

The importation of Russian rouble notes is prohibited as from May 11.

Canada.—The export of sodium carbonate is prohibited to all destinations except under licence as from May 22, and of rubber tyres except under licence as from May 29.

The Bd. of Trade J., July 18, gives a list of articles the importation of which is prohibited except under licence as from June 3. The list includes fireworks, nuts fruits, certain metals, marble, perfumery, and perfumed oils and spirits.

The export of gold coin, gold bullion, and fine gold bars is prohibited as from June 3 except under licence from the Minister of Finance.

China.—The basis for the revision of the customs tariff is fixed at 5 per cent. of the average values of imported merchandise during the five years 1912—1916. The determination of the average values is left to the Tariff Revision Conference. The tariff so framed will be subject to revision not later than two years after the end of the war. It is hoped that the work of revision on the basis of the fore-

going formula will be completed within three months.

Finland.—The import of all classes of goods is prohibited as from June 23. Applications for licences should be made to the Trade and Industry Bureau in Helsingfors.

France and Algeria.—Applications for import licences in respect of goods of U.K. origin sent by parcel post will be subject to new procedure as from August 1. Full details are given in the Bd. of Trade J., July 11.

A decree dated July 15, abrogates the provision of the decree of June 4 whereby sea salt, salina and rock salt, crude or refined, were allowed to be exported and re-exported without special authorisation when destined for the U.K. and certain other countries.

The export of documents representing cash is now allowed to allied or neutral countries, except in certain cases. The full text of the decree dated July 3 may be seen at the Department of Overseas Trade.

Holland.—The export of paper yarns and fabrics woven therefrom is prohibited as from June 26.

Italy.—The export of alabaster is prohibited.

Japan.—The new regulations relating to the control of rice may be consulted at the Inquiry Office, Department of Overseas Trade.

Johore.—The export duties on cultivated rubber have been revised as from March 23. The new rates are given in the Bd. of Trade J., July 4.

Leeward Islands.—The importation into Antigua of, *inter alia*, chinaware, glassware, earthenware, pottery, porcelain and perfumery is prohibited as from July 1.

Newfoundland.—An export duty of 2 cents per gallon upon fish oils and of 20 cents each upon seal skins has been levied as from May 11.

New Zealand.—The import of brandy, whisky or rum of less strength than 25 degrees underproof is prohibited as from April 18.

The export of hides and calf skins is prohibited to all destinations as from April 16, except with the consent of the Minister of Customs.

Nicaragua.—Copies of a circular of the Nicaraguan Customs Administration dealing, *inter alia*, with the requirements as to the description in Consular invoices of merchandise shipped to Nicaragua may be seen at the Department of Overseas Trade. Special details are required in certain cases, *e.g.*, for wire, medicinal products, perfumes and toilet articles, etc.

South Africa.—The Board of Trade has received a copy of an Act which is to come into force at a date to be fixed by the Governor-General providing for the registration of all dairies, condensed milk, butter and margarine factories, and regulating the sale of dairy products.

Sweden.—The export of chemicals, cardboard and paper, etc., is prohibited as from July 1.

United States.—The Bd. of Trade J., July 4 and 18, gives certain recent rulings of the War Trade Board on the subject of import and export prohibitions. Among the articles affected are coin, bullion and currency, chrome ore and chromite, coconut meat, graphite, oilcloth and linoleum, palm oil, paper, tallow and vegetable ivory.

After June 25 no licences will be issued for the importation of manufactured rubber goods containing more than 5 per cent. of rubber, and outstanding licences granted since that date have been revoked.

The import of crude rubber, gutta-percha, balata, etc., is restricted as from May 7, and all outstanding licences have been cancelled as from May 8.

TRADE NOTES.

British Market for American Barium Carbonate.
American chemical manufacturers are advised by the Bureau of Foreign and Domestic Commerce that an excellent opportunity is afforded by the demand in Great Britain for barium carbonate, which is likely to grow in view of the requirements of brick-makers, who use the precipitated carbonate as a scum preventive. Germany supplied this market before the war, the cost at Bristol being £7—£8 per ton (93—98 per cent. purity). Great Britain is now making an inferior product selling at £41—£46 10*s*. per ton. There is at present an English import tax of about 3*s*. per ton, but liberal trade arrangements with the United States are anticipated after the war.—(*Oil, Paint and Drug Rep., May* 13, 1918.)

Exports of Coconut Palm Products from Ceylon in 1917.—The Report of the Ceylon Chamber of Commerce for the year ended December 31, 1917, states that a considerable decrease took place in the exports of products of the coconut palm during the year. Coconut oil, however, was an exception.

Total Exports.

	1916	1917
Coconut oil	322,316 cwt.	428,206 cwt.
Copra	1,284,573 ..	750,438 ..
Desiccated coconut	34,308,454 lb.	30,076,774 lb.
Coconut poonac ..	79,676 cwt.	41,274 cwt.
Coconuts	4,079,608 nuts	3,668,811 nuts

—(*Indian Trade J., April* 12, 1918.)

Cost of Ammonia Soda in Japan.—Mr. Hirano, of the Japanese Department of Agriculture and Commerce, has calculated that the cost per ton of ammonia soda produced in Japan is about £4 18*s*. by the Solvay process and £4 12*s*. by the Shreib process. By comparison, the pre-war price of imported soda was about £2 2*s*., which included an import duty of 12*s*. The present war price is about four times this figure, but it is expected that after the war, when freightage becomes normal, the former price will be restored. In that event the Japanese product will be unable to compete with the imported article unless the Government gives further assistance and there is a reduction in the price of salt, the high cost of which is mainly due to the heavy taxes.—(*The Chem. Technol., March*, 1918.)

Japanese Isinglass.—The average yearly production of isinglass in Japan is valued at about £600,000. The exports of the product in 1916 amounted to 3,540,000 lb., an increase of about 25 per cent. on the previous year. During 1917 the trade suffered from shortage of tonnage, the exports up to November amounting to 2,680,000 lb. In pre-war days Germany headed the list of European importers of this product, but its place has now been taken by England, Russia, America, and France.—(*The Chem. Technol., March*, 1918.)

Vegetable Oil Industry in Japan.—According to H.M. Consulate at Shimonoseki, the Japanese oil industry is still in its infancy, but it should have an important future. A new company for the exploitation of vegetable oils, formed in June, 1917, with a capital of one million yen, has completed the first section of its works at Wakamatsu, and manufacturing operations will soon be commenced. The consumption of soy beans will, it is stated, be 100 tons per day, and when the second section of the works is completed, 150 tons per day, with a yearly yield of 37,000 tons of bean-cake, and 6300 tons of oil. The refined oil will be exported to the United States.—(*Bd. of Trade J., June* 20, 1918.)

Japanese Trade in Fertilisers.—H.M. Commercial Attaché at Yokohama states that in 1917

Japan imported fertilisers to the value of 78,138,819 yen (yen = 2*s.* 0½*d.*)—7½% of the total import trade—as compared with 42,683,313 yen in 1916 and 70,680,152 yen in 1913. Imports of sulphate of ammonia have much decreased—14,980 tons in 1917 and 7107 tons in 1916, compared with 110,635 tons in 1913. The average price in 1917 was 306 yen per ton. Of nitrate of soda, 54,650 tons was imported in 1917, as against 45,655 tons in 1916 and 26,515 tons in 1913. The average price in 1917 was 194 yen per ton. Imports of oil-seed fertilisers amounted to 1,066,660 tons, valued at 55,967,822 yen, an increase of nearly 25% over 1916. Shortage of phosphatic fertilisers is causing anxiety, the importation of phosphate rock being still much smaller than in pre-war days. Imports during 1917 were 154,212 tons as compared with 328,658 tons in 1913. In consequence of the restriction imposed by the Government, the exportation of fertilisers has greatly declined since September last.—(*Bd. of Trade J., June* 20, 1918.)

China's Foreign Trade in Chemicals, etc.—The annual report on the foreign trade of China, issued by the Maritime Customs, states that the net value of the direct foreign trade in 1917 was Hk. taels 1,012,450,404—the largest on record and over 14 million taels above the figure for 1916 (Haikwan tael = 4*s.* 3¾*d.* (aver.) in 1917). The list of imports shows that not only values but quantities were higher, while in the case of exports special and temporary causes were responsible for the reduced export of only two articles—tea and sesamum seed. The importation of metals was slack, and that of vegetable oils fell from 2,043,864 to 564,162 gallons. . Nearly all metals were exported in greater quantities than in 1916, the increase for antimony, regulus and crude, being 56 per cent. Increased quantities of copper and iron were sent to Japan, and of lead ore and tin, chiefly to America. Bricks, tiles, and cement, which are growing industries in China, were exported much more freely, as were egg albumen and yolk, leather, liquorice, skins and hides, and timber. The exports of sesamum seed, ground nuts, dressed skins, and wood oil fell away seriously.—(*Bd. of Trade J., June* 27, 1918.)

French Indo-China in 1916.—*Annam*: Exports from this district in 1916 included 854,206 lb. of cinnamon, 15,560,630 lb. of sugar, egg yolk valued at £2900, and albumen valued at £1850. The chief imports of chemical interest were medicines, valued at £2260, and firecrackers, valued at £1700. *Tonkin*: This province is rich in agricultural and mineral resources. The exports in 1916 included 143,079 lb. of aniseed, 16,755 lb. of benzoin, 48,939 tons of cement and cement stone, 419,110 tons of coal, 202,162 lb. of lacquer, 424 tons of tungsten and 39,403 tons of zinc, 434,086 lb. of castor oil, and 847,889 lb. of lacquer oil. The total sales of coal show a gradual increase from 221,403 tons in 1907 to 733,473 tons in 1916. The exports of metallic products also show large increases, an interesting feature in this trade being the development of a wide market in Japan.—(*U.S. Com. Rep. Suppl., April* 10, 1918.)

Lemon Citrate and Essence in Eastern Italy.—Owing to the difficulty of exporting lemons, growers are sending their stocks to citrate works. The result is that the production of this material in the past year has been high (exact figures are not yet available). There is also a large stock of the corresponding by-product, lemon essence, which is being offered at a record low price. The optical rotation of this year's product is unusually high (61°—66°). The low percentage of citral which generally accompanies a high optical activity is again noted, the average being well under 4 per cent.—(*U.S. Com. Rep., April* 23, 1918.)

Citrus Products in the United States.—Various members of the genus *Citrus* have long been established on the American continent, but until recent times little regard has been paid to them as a source either of essential oil or of citric acid. In the last decade, our West Indian Colonies have devoted much attention to the extraction and marketing of citrus products, Dominica and Montserrat lime oil and lime juice, and Jamaican orange oil being examples. The utilisation of lemon products has, however, hardly passed the experimental stage, and Sicily and Calabria have possessed a virtual monopoly in the citrate of lime and lemon oil trade. Recent developments in the U.S.A., in particular the placing of these products on the War Trades Board's list of restricted imports, point to this monopoly being threatened.

In 1915, the total Italian exports of citrate of lime amounted to 15,000,000 lb., of which the U.S.A. took 40 per cent. The production of citric acid in the States has risen steadily from 2,729,943 lb. in 1914 to 4,032,000 lb. in 1917, but this has, in the main, been produced from imported citrate of lime. In 1915, the Californian Fruit Growers' Association installed a plant for the recovery of citrus products, and an attempt is being made to render the American market independent of foreign supplies. Government aid is being given to fight insect pests. The main obstacle in the way is the high cost of labour, in particular with regard to the production of essential oil, and efficient machinery will have to replace the hand presses of Sicily. The possibility of distilling the oil is also under consideration.—(*Perfum. and Essent. Oil Rec., June,* 1918.)

American Coal Tar Products in 1917.—The United States Tariff Commission has just completed its census of products for 1917, and pending the publication of its final report, the following facts are available.

Dyes.—There were 81 establishments engaged in the manufacture of dyes in 1917, and the total production amounted to 45,977,246 lb. valued at $57,796,027. In quantity, this is practically identical with the imports before the war, but the nature of the dyes is very different. Thus, the highly important indigoid and alizarine vat dyes, after subtracting the extract prepared from imported indigo, only amount to 3 per cent. of the pre-war imports. The lack of development in this class should be remedied this year as several firms have begun the manufacture of various members of the group and a large increase in the production is expected. The production of other classes of dyes shows big increases, a surplus being available for export. During the fiscal year 1917, American-made dyes to the value of $11,709,287 were exported.

Intermediates were manufactured by 117 firms, the total production being reported as 322,650,531 lb., valued at $106,942,918. These figures are really too high, since a complex derivative is reported as well as the simpler derivatives from which it is derived. Thus each product in the chain, nitrobenzene, aniline, acetanilide, nitroacetanilide, and nitraniline would be reported separately and the total is thus greatly swollen. Other products included 5,092,558 lb. of colour lakes, valued at $2,764,064; 2,236,161 lb. of medicinal chemicals, valued at $5,560,237; 779,416 lb. of flavours, valued at $1,862,456; 263,068 lb. of photographic chemicals, valued at $602,281; and 19,545 lb. of perfumes, valued at $125,960.—(*Oil, Paint and Drug Rep., June* 10, 1918.)

Dyes for Peruvian Textiles.—The principal consumers of dyes in Peru are the Indians, who manufacture coarse, heavy fabrics which they dye in their own homes in very vivid colours. The supply

of the necessary dyestuffs was formerly in the hands of the Germans, who advertised largely and specially adapted the packing of their goods to meet the native taste. The Indian is very conservative, and if his custom is desired it will be necessary to imitate the German packages. These consisted of small tin cans holding 50—100 gms., wrapped in paper of a colour corresponding to the contained dye. A bright label, usually a lithographed representation of a puma or other Peruvian subject, was generally attached to the can. Aniline was shipped in barrels of 50—100 kilo., with an inner lining of tin plate.—(*U.S. Com. Rep., April 22, 1918.*)

Cacao Crop in Puerto Cabello District (Venezuela).—Despite a late start in the winter harvest, a fair yield of cacao is expected from this district. Prevailing prices are low, 11·2 cents being paid for the first-class product and 8·4 cents for the second class, as against 14·4 cents and 11 cents in the previous year. The highest grades are normally exported to France, but, as this market is not now available, much was sent to the United States. Altogether, 6,288,558 lb. of cacao was exported during the year 1917, an increase of 30 per cent. over the previous year. The prospects for the summer harvest are considered to be good.—(*U.S. Com. Rep., April 9, 1918.*)

Tanning Materials from South America.—The Dominican Republic offers a dependable supply of divi-divi, a valuable tanning agent containing 30% of tannic acid. Formerly, this was exported to Hamburg, where it sold for about £8 10*s.* per ton (of 2000 lb.). During the past few years, however, it has found a ready market in New York, realising £10 10*s.* to £11 10*s.* per ton, f.o.b. New York. Large shipments are now taking place and further developments in the industry are expected. The annual exports of divi-divi from Monte Cristi formerly exceeded 2,000,000 lb., but of late years the figure has decreased owing to the damage done by a parasitic type of orchid which grows upon the plant, often killing it and, in any case, decreasing the production.

There has also been a big development in the tanning industry of Chile. Lingue bark is the best known tanning agent and enormous quantities exist in the forests of the southern provinces. A considerable export trade in sole leather has sprung up, based on the use of this material. Other tanning agents in use are Ulmo (elm) bark, and the fruit of the Carob tree. Several factories for the manufacture of tannin from Ulmo bark have existed in Valdivia for the last ten years, the product being mainly exported to Germany and France.—(*Oil, Paint and Drug Rep., June 3 and 10, 1918.*)

The Export Trade of Para (Brazil).—H.M. Consul reports that the depreciation of over 30 per cent. in the value of rubber during 1917 accounts for the general lack of prosperity, since this State very largely depends upon its exports of this commodity. Although it is impossible to develop British trade at present, yet preliminary work can be performed. Well-paid travelling agents, well versed in Portuguese are essential, and quotations should be made in the metric system and in decimals. The total exports of Brazil nuts in 1917 were 8355 tons, of which 92% went to the United States and 7·7% to Great Britain (the imports into the U.K. were restricted to 25% of the 1916 receipts by an Order in Council). Of the total shipments of 4501 tons of cacao, 3413 tons was shipped to the United Kingdom and 1087 tons to the United States. The exports of hides amounted to 1209 tons, 591 to Europe and 617 to the United States.—(*Bd. of Trade J., July 4, 1918.*)

COMPANY NEWS.

BRUNNER MOND AND CO., LTD.

At the annual general meeting held last month in Liverpool, Mr. Roscoe Brunner (the new chairman of the directors) presided, and in moving the adoption of the report and accounts, referred to the resignation from the chairmanship of Sir John Brunner, who had held the position since 1890. The increase in capital (this J., 1918, 63 R, 103 R) which had been sanctioned by the Treasury, did not call for any further comment. Patents stood in the balance sheet at only £1800, but were worth very much more. The net profit for the year ending March 31 last was £1,111,848 (£1,117,200 in the previous year). A dividend of 25 per cent. on the ordinary shares was paid in December last, and the directors now recommended an additional 12 per cent., representing 11 per cent. for the year on the new capital, including the bonus shares. The reserves now total £468,009 against a capital of £9,244,600.

Alluding to the development of amalgamation proposals in the chemical industry, the chairman, speaking for the directors, said that their idea was that there should be four heavy chemical groups: acids, alkalis, etc.; dyes; explosives; and fine chemicals. They had no quarrel either with the proposed amalgamation in the dye group or with the merger in the explosives group; nor could they object if these two groups came closer together, as seemed likely; but they thought that each group should keep to its own sphere. Their group of companies was prepared at all times to supply raw materials to the dye industry at reasonable prices, and they would be prepared to make and sell intermediates, if desired, for in this way they would be able to help the textile industry, which was a big customer of theirs.

The report and accounts were adopted unanimously, and a vote of thanks was passed to Sir J. Brunner for his invaluable services.

BRITISH CYANIDES CO., LTD.

The annual ordinary general meeting was held in London on June 27, Mr. C. F. Rowsell (chairman of the company) presiding. After referring to the loss of two colleagues, Mr. A. M. Chance and Mr. Gordon Salamon (technical director), the chairman reviewed the accounts presented. The net earnings during the past financial year were £36,725, as against £16,040 a year ago. The dividend has been increased from 12 to 14 per cent., and £36,725 is carried forward, as against £16,040. Investments in allied companies include 10,000 shares in the Oldbury S.C. Syndicate (formed for the exploitation of the barium process), and 26,499 shares in the British Potash Co. The company, which has now become a public one, was originally formed to produce cyanide from gas liquor by the barium process, in which the technical advisers still have the fullest confidence, but the exigencies of the war necessitated placing this process in the background, and undertaking the manufacture of the refined chemicals of which Germany formerly had the monopoly. Since then a further very important development has taken place. The company, in association with the North Lincolnshire Iron Co., and others, has combined with the Government to form a company to initiate and develop a potash industry in this country. To meet with the new requirements the business and works of F. Danks, Ltd., have been acquired.

Mr. Kenneth M. Chance (managing director) then gave a lengthy review of the company's activities, past and present. Among the new manufactures undertaken by the firm are those of potassium

permanganate and red prussiate of potash, and sufficient of the latter is now being made, not only to meet home requirements but to permit of exportation. The standard of purity attained for these products is at least equal to the German, and that of the pure carbonate of potash is superior.

The interim dividends of 12 per cent. already paid on the preference and ordinary shares were confirmed, and a final dividend at the rate of 14 per cent. on both classes, less interim dividends already paid, was approved.

Magadi Soda Co., Ltd. The report of this company for 1917 shows a debit balance of £16,771, and an accumulated debit at profit and loss of £51,945. Serious consequences had followed from the commandeering of the properties, and sales had declined to a value of £800 (as against £3800), and no allowance had been made for depreciation. An allocation for this purpose will be made when the company is in receipt of the compensation claimed for the use of its railway and water supply by the authorities in British East Africa. In his speech at the seventh ordinary general meeting on June 24, the chairman, Mr. S. Samuel, referred to the difficulties due to Government control, and to the serious depletion of the company's resources through three years' interruption of normal development, and said that it would be necessary to arrange for a temporary loan. Trade had recently improved, and up to date the quantity of soda shipped was double that for the whole of 1917, and they had made some remunerative forward sales. One of these sales was for an Eastern market, and the company's geographical position was such that, given the requisite freight space, none of its opponents could compete with it in the East, where large and increasing quantities of soda were being consumed.

The United Steel Companies, Ltd. According to the *Financial Times*, an important amalgamation, under the above title, of the following iron and steel companies has been effected:—Steel, Peech and Tozer (Sheffield); Samuel Fox and Co. (Sheffield); Workington Iron and Steel Company (Cumberland); Frodingham Iron and Steel Company (Lincs); Appleby Iron Company (Lincs); and Rother Vale Collieries (Yorks). The share capital of the new company is £7,680,000. Present profits are stated to be at the rate of £1,040,000 per annum, after allowing for excess profits duty, munitions levy, depreciation, etc.

Thermit, Ltd., informs us that the whole of the company's shares which, in August, 1916, were sold by the Public Trustee to the Birmingham Metal and Munitions Co., Ltd., have now been taken by Nobel's Explosives Co., Ltd., Glasgow, into its own holding, and under the new auspices the company's activities are being considerably extended. All alien enemy interests have now been eliminated.

Courtaulds, Ltd., announce that the proposal of the directors to capitalise the surplus assets of the company (this J., 1918, 103 R) has failed to meet with the approval of the Treasury.

The Consolidated Gold Fields of South Africa, Ltd., has secured a substantial interest in the firm of Johnson Matthey and Co., gold, silver and platinum refiners, Hatton Garden, E.C.

H.M. Treasury has sanctioned the issue of the prospectus of the *British Platinum and Gold Corporation, Ltd.*, a company formed to acquire platinum and gold interests in the Republic of Colombia.

PERSONALIA.

Sir E. Rutherford, Langworthy professor of physics in the University of Manchester, has been elected a foreign member of the Reale Academia dei Lincei, Rome.

Dr. R. F. Ruttan, director of the chemical department of the McGill University, Montreal, and a vice-president of the Society of Chemical Industry, has been elected vice-president of the Royal Society of Canada.

The degree of Doctor of Science—D.Sc. (Manc.)—has been conferred upon Mr. E. Ardern, chief chemist to the Manchester Corporation Sewage Works, and upon Mr. E. W. Smith, chief chemist to the City of Birmingham Gas Department.

Mr. A. A. Campbell Swinton has been re-elected chairman of the Council of the Royal Society of Arts for the ensuing year.

Lord Glanely has given £25,000 to the Cardiff University towards the establishment of a chemical laboratory.

The late Lord Rhondda left £20,000 to Gonville and Caius College, Cambridge, preferably for the foundation of six to ten scholarships for mathematics, natural science, or moral science (including economics). In the award of the scholarships preference will be given to residents, or sons of residents, in Wales or Monmouthshire.

Major J. Purroy Mitchell, ex-Mayor of New York, who gave the civic welcome to the Society of Chemical Industry on the occasion of its visit to New York in 1912, has been killed in a flying accident in the United States.

Sir Robert K. Inches, head of the firm of Hamilton and Inches, goldsmiths, of Edinburgh, died suddenly on July 19 last. Members who attended the annual meeting in 1916 will remember the welcome he extended to the Society in his capacity of Lord Provost of Edinburgh on that occasion.

The recent death of Lord Parker will recall his judgment in the Levinstein case (this J., **35**, 800) whereby the compulsory working of the Patents Law was stultified.

Professor F. P. Treadwell, professor of analytical chemistry at the Zürich Polytechnic, died on June 24 last.

The death is also announced of Dr. J. Thiele, ordinary professor of chemistry at Strassburg University.

PUBLICATIONS RECEIVED.

HIGH EXPLOSIVES. *By* CAPTAIN E. DE W. S. COLVER. *Pp.* 830. *(London: Crosby, Lockwood and Son.) Price* 63s.

THE ZINC INDUSTRY. *By* ERNEST A. SMITH. *Pp.* 223. *(London: Longmans, Green and Co.) Price* 10s. 6d.

COLOUR IN RELATION TO CHEMICAL CONSTITUTION. *By* E. R. WATSON. *Pp.* 197. *(London: Longmans, Green and Co.) Price* 12s. 6d.

THE RECOVERY AND RE-MANUFACTURE OF WASTE PAPER. *By* JAMES STRACHAN. *Pp.* 158. *(Aberdeen: The Albany Press, Bridge Street,* 1918.) *Price* 12s. 6d.

According to the *Iron Age* the number of electric steel furnaces in the United States increased from 136 in 1916 to 233 in 1917.

REVIEWS.

THE EDIBLE OIL INDUSTRY.

EDIBLE OILS AND FATS. *By* C. A. MITCHELL (*Monographs on Industrial Chemistry Edited by Sir Edward Thorpe*). *Pp.* xii + 159. (*London: Longmans, Green and Co.*, 1918.) *Price* 6*s*. 6*d*. *net*.

Any reference to the chemistry of oils and fats in the pages of this Journal must inevitably recall the name and to his many friends, the personality of Lewkowitsch, whose exhaustive book on the subject still remains the standard work in all languages. Lewkowitsch's professional practice gave him a very special insight into the state of development of this industry though for reasons which are both obvious and proper, he was far from putting all he knew into his book. The industries based on the fats and oils are to-day very highly developed both technically and scientifically and fortunately this country has every reason to be satisfied with the part played by our own manufacturers in their advancement. It is true that until quite recently we were content to import from Holland and Denmark the bulk of the margarine consumed, but this is largely to be ascribed to the extreme national prejudice against all substitutes for butter which made the margarine industry in Britain essentially speculative in character. As is well known only one firm had undertaken this manufacture on a really large scale and it is to the enterprise and foresight of this company that the present favourable state of affairs as regards the home production of this commodity is in the main due. Chemists should be generous of praise in this instance as the company has apparently received somewhat less than justice from the State.

A few months ago when rationing was first introduced, a serious shortage of edible fats appeared likely owing to the cessation of imports of butter and margarine and the decrease in the meat supply with its accompanying fat. It became necessary to set aside all fats suitable for edible purposes and to restrict severely their use in soap making and other industries. A number of new plants for the refining of oils and their conversion into margarine have been erected under the general supervision of the Department of Oils and Fats, and to-day the position is a satisfactory one and reflects great credit on the manufacturers and on this department of the Ministry of Food. The British public has learnt to eat margarine and even to like it.

The main basis of modern margarine is oil of vegetable origin prepared from seeds either by crushing or extracting. The oils mostly reach this country in the form of seed and the British oil crushers have had largely to extend their plants to deal with the increased quantities. As the residue of the seed after removing the oil forms an excellent cattle food the establishment of the seed crushing industry in England has a double advantage. Before the war practically all the extraction of palm kernel oil was carried out in Hamburg though the kernels themselves were in the main derived from British possessions. Some of our colonies are prepared to differentiate by means of an export duty after the war against kernels going to other countries than Britain, and it is sincerely to be hoped that all oil seeds will be preserved to the Empire by legislation. The demand for these is likely to exceed the supply of easily procured materials for some years to come, and they form a far more valuable asset of the Empire than is generally realised.

Pre-war margarine contained a considerable proportion of animal fat—oleo, and in the best qualities the presence of this is desirable but a quite satisfactory article can be made without it. It will probably be agreed by the public that the quality of our margarine has on the whole declined since fixed control prices were introduced. This is an unfortunate but necessary corollary of a bureaucratic system when all incentive to excel is removed, nay even penalised, by the loss of profits resulting from increased attention to quality.

The foregoing remarks will serve to indicate that Mr. Mitchell's book is published at a time when more than ordinary interest attaches to his subject and it is therefore likely to be read critically by many, newly engaged in the industry. Such readers will probably be disappointed if they infer from the title that the book deals with the industrial chemistry of oils and fats. As explained by Sir Edward Thorpe in a preface, the series of monographs on Industrial Chemistry of which this forms one is intended in the main to show the relation of principle to practice so that Mr. Mitchell deals with the chemistry of those oils which can be made edible rather than with their technology. He is particularly concerned with the analysis of oils and the detection of admixture—a section of their chemistry which, as is well known, offers the widest scope to the analyst. This section of the book is quite up to date and should be of considerable use to the factory chemist: it compares favourably with that devoted to the extraction and purification of oils, which is in the main a description of machinery and makes no reference whatever to the many intricate chemical problems which exist at almost every stage of the process. After all it is these which have to be solved by the works chemist and manager if an edible oil is to be produced economically. In our opinion the book can hardly justify its title without their fuller consideration.

The characteristics of individual edible oils are dealt with at considerable length; several of those mentioned are of little or no commercial interest. The choice of oils available for use in margarine is much more limited than might be inferred from the number mentioned. To-day palm kernel and arachis are those chiefly used, cotton oil having ceased to arrive from America.

A short chapter is devoted to the hardened oils about which very little information has as yet transpired in the technical literature. The old fallacy, that they contain nickel in appreciable quantity, arising from some continental publications is repeated: it is time this was authoritatively contradicted so far as the English products are concerned. This was done recently at a meeting of the Liverpool Section of the Society.

A final chapter deals briefly with the manufacture of margarine; in this as elsewhere the author somewhat fails to live up to the ideals expressed in Sir Edward Thorpe's preface as for example, that the book should indicate new and only partially occupied territory in chemical industry. We must perforce attempt this and close our remarks by expressing the same conviction as will be held by the intelligent visitor to the modern chemically managed margarine factory, namely that we shall live to eat margarine made from vegetable fats and synthetic milk and flavoured with an aroma produced by a pure culture of bacteria!

E. F. ARMSTRONG.

FUEL. SOLID, LIQUID, AND GASEOUS. *By* PROF. J. S. S. BRAME. *Second Edition. Pp.* 372. (*London: Edward Arnold.*) *Price* 15*s*. *net*.

The first edition of this work in 1914 formed the most comprehensive and lucid treatment of the subject of fuel in text book form which had been issued, and it is not surprising that a second edition

has now been called for. The work is based upon a course of lectures delivered at the Sir John Cass Technical Institute by the author. So many branches of fuel chemistry and engineering have been touched upon that severe analytical treatment of any branch or process has not been possible, and presumably has not been intended, but numerous references will make it possible for students and others to follow up in more detail those matters in which they happen to be particularly interested. The subdivision adopted is indicated by the title, solid, liquid, and gaseous fuel being treated in turn, while a fourth section is added descriptive of laboratory operations and entitled "Fuel analysis, calorimetry, and control of fuel supply." A useful introductory chapter deals with such subjects as the production of flame, ignition point, and calculation of calorific value from analysis. The discussion of gross and net calorific values is not completely satisfactory, but in other respects this introduction is excellent and is likely to prove very useful to students approaching the more specialised descriptions and considerations contained in later chapters.

The third and fourth chapters on coal and its constituents and the physical properties of coal are noticeable as bringing under review a considerable amount of recent work, particularly that carried out in America, and a couple of useful pages is given to the treatment of a subject of primary, practical importance, that of coal ash. Under the title of "Endothermic character of coal" there appears a confusion which seems to be all too common in this matter, since we are told that coal "gives out on burning not only heat by the combustion of the coal substance, but some additional heat which may be regarded as rendered latent at the time of its formation." This obscures the fact that the formation of the coal from its elements is exothermic and decomposition into its elements endothermic, but that such partial decomposition as occurs in the process of destructive distillation is exothermic.

The treatment of liquid fuels is very satisfactory, the prospects of benzol, alcohol, and tar receiving some attention, and the reference to the important 1916 paper of Lomax, Dunstan and Thole on the Pyrogenesis of Hydro-Carbons may be regarded as indicative of the care taken in bringing this section up to date.

Under gaseous fuels considerable space is given to the different varieties of fuel gas, including a description of the "ammonia recovery process" and modern water-gas and suction plants; this section is admirable, and as is noticeable throughout the work, clear printing is supplemented by excellent and well chosen diagrams. Some interesting data are put forward in the concluding chapters of this section on the comparative economies and efficiencies of gas and steam plants. As would be expected from the author, the subject of fuel analysis and control is well handled, and the omission of illustrations and descriptions of what should be obsolete and is unreliable apparatus is to be welcomed warmly.

One chapter is devoted to scientific control of the purchase of fuel and its combustion, and automatic CO_2 recorders are described in some detail, but for some reason no treatment of the pyrometer, which forms an essential part of the equipment of any chemist or engineer dealing with furnaces and fuel, is attempted.

The book as a whole is excellent, and one which is likely to be of service, not only to the large class (particularly mentioned by the author), "to whom power production is of importance," but to all concerned with fuel and its uses.

JOHN W. COBB.

OBITUARY.

A. SENIER.

Born January 24, 1853——Died June 29, 1918.

The death in Galway of Professor Alfred Senier will be regretted by a large circle of friends and by his past students who respected him greatly. Although born in Lancashire, he took his M.D. degree at Michigan University. On returning to England, he became Assistant and then Demonstrator at the Pharmaceutical Society, London; and from 1881 to 1884 he was Chemical Lecturer in St. John's College, Battersea.

He assisted in founding the Aristotelian Society and acted as its Hon. Secretary till 1884. He then took the Ph.D. degree in Berlin where he studied under Professor von Hofmann whom he profoundly admired and of whom he has written: "With such a leader in research, with such a teacher, in the right meaning of the word, no wonder that those who came within his influence became inquirers and teachers too."

In 1891 he accepted the Chair of Chemistry in Queen's College, Galway, where his inspiring influence as a teacher, his generosity and interest in student life made him a marked success. He was made an honorary D.Sc. of the Royal University, and a member of the Senate of the National University of Ireland. In 1912 Professor Senier acted as President of the Chemical Section of the British Association. His researches were concerned mainly with cyanuric acid, acridines, and with phototropic and thermotropic compounds.

He is survived by his wife and two daughters.

W. S. M.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, &c., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.* [*Telephone: London Wall, No. 2429. Telegraphic Address: Inducheni, Finsquare, London.*]

THE BRITISH SCIENTIFIC PRODUCTS EXHIBITION.

As previously announced in these columns (175 R, 225 R) a well organised effort is being made to bring home to the public the value and necessity of scientific research in regard to its application in the arts and industries.

At a time when "the lessons of the war" has become a phrase on everyone's lips, it is particularly necessary that prominence should be given to the valuable services rendered to the country by scientific workers and manufacturers, and that every effort should be made to drive home the truth of Professor Findlay's dictum that "Science stands for efficiency in all the activities of life, and the neglect of science spells waste and industrial decay."

Of the services rendered by British science during the war probably only a tithe can be disclosed at the present time, but even the list which is available is of sufficient length to impress the most unimaginative. The precarious state of affairs which existed in this country when war broke out, and on other subsequent occasions, owing to the dearth of certain essential raw materials and manufactured products, is a story which cannot be too often repeated, and no effort could be more useful than that of the British Science Guild in organising an ocular demonstration of these very materials and products, and in conveying the necessary explanations of the ways in which their scarcity or absence has been overcome. The success of the efforts made to provide our fighting and civilian populations with such vital materials as optical glass, benzene, toluene, tungsten, fuel-oil, nitrogen compounds, fats and oils, dyes, drugs, refractories &c., may be familiar enough to the chemist, but unless the essential facts and their all-important implications can be brought home to the general public here and now, the prospects of science receiving adequate recognition in the future will be poor indeed.

It is a welcome sign that in spite of many obvious difficulties no fewer than 250 manufacturing firms have sent exhibits, and it is no less pleasing to note that the Air Ministry and the Food Production Department have shown the way to other Government Departments by according their active support. It is, however, far from satisfactory to learn that no financial aid of any kind has been granted from public funds. Perhaps the Ministry of Information may see its way to assist a scheme which is not only national in character, but essentially educative in aim, and thereby relieve those responsible from liability and anxiety.

The Exhibition, which is under the patronage of His Majesty the King, is being held at King's College, London, W.C., from August 12 until September 7 inclusive.

British Industries Fair (Glasgow), 1918. The Fair will be opened by Sir Arthur Steel-Maitland, of the Board of Trade, in the Kelvin Hall of Industries, Glasgow, on August 19, 1918. Only British manufacturing firms will exhibit. Admission will be confined to trade buyers only, and invitations can be obtained on application from the General Manager, Mr. J. Freer, 38, Bath Street, Glasgow, or from the Director, British Industries Fair, Board of Trade, 10, Basinghall Street, London, E.C. 2. The exhibits will include Light and Heavy Chemicals, Domestic Chemical Products, Foodstuffs (prepared and preserved), and Textiles of all descriptions. The Fair will remain open until August 31.

THE PRINCIPLES OF DIFFUSION.

Dr. Horace T. Brown's lecture on "The Principles of Diffusion, their Analogies and Applications," was delivered before the Chemical Society on June 6, and is published in the July issue of the Society's Journal.

The author's classical work on this subject had its origin in the difficulty of explaining the supply of carbon dioxide to the assimilatory centres of a leaf in sufficient quantity to account for the carbohydrates formed. Experimental investigation of the laws of diffusion as applied to the passage of gases through small apertures has led to a complete explanation of the mode by which the diffusive flow can be accelerated by such structures as are found in the leaf.

Reference was made first to the long series of experiments on the diffusion of gases and dissolved substances carried out by Graham, who however did not attempt to formulate any general law connecting the three variables, time, concentration, and space traversed by the diffusate. Graham's results were later developed by Fick into a fundamental law of diffusion, which was derived from the principles laid down by Fourier in his treatise on the Analytical Theory of Heat. According to this law, "the transfer of salt and water occurring in a unit of time between two elements of space with differently concentrated solutions of the same salt must, *ceteris paribus*, be directly proportional to the difference of concentration and inversely proportional to the distances of the elements from one another." That the course of gaseous diffusion also can be expressed by Fick's law was shown by Loschmidt, the partial pressures of the gases being equivalent to the concentrations of the solutions.

Various concrete examples of diffusion in typical and well-defined systems were considered. With a diffusive column which has attained the steady condition of flow, the relations of the various factors determining the rate of flow and the distribution of density in the column are capable of simple mathematical treatment. In a number of different systems the author has been able to obtain visual evidence of the shape and relations of the zones of equi-density, in the first place by the intermittent diffusion of solutions of sulphates and chromates into a gel of agar or gelatine containing a little barium chloride, and latterly by means of the Liesegang phenomena. The beautiful results obtained in this way furnish a very striking justification for the theoretical expectations.

When the diffusate is still in process of extension into fresh regions of the column the system can be determined, not by elementary mathematical treatment, but from Fick's basic equation, provided that certain information as to the conditions is available.

In cases where the stream lines are no longer parallel but have been rendered convergent or divergent, the density gradient of the diffusate ceases to be uniform from end to end of the column. It is easy to show that, with two spheres of different dimensions acting as perfect absorbers in the same field of diffusion and placed so far apart that there is no appreciable mutual interference, their relative efficiencies—as defined by the amount of diffusate they absorb in a given time—are proportional, not to their surfaces, but to their linear dimensions. Thus, the phenomena of steady diffusion around a sphere are strictly analogous to those exhibited by a freely suspended and insulated, electrified conductor. There are a number of other intimate analogies of diffusive to electrostatic and also to acoustic phenomena, and to some of these attention was directed.

Among other interesting points brought out were these:—(1) Under appropriate conditions, the activity of unit mass of a catalyst must vary not with the surface but with its square. (2) Diffusion shows in a simple manner how it is that minute dimensions facilitate the nutritive, and thus the fermentative and putrefactive, processes of certain micro-organisms, and further explains certain apparently obscure chemotatic phenomena.

One of the most interesting cases considered by the author is that in which a multi-perforate septum is inserted in a line of diffusive flow. The shape and position of the equi-density zones show that the stream lines converge towards each opening and diverge and become parallel again on the other side of the diaphragm. So marked is this effect that the blocking of 90 per cent. of the cross-section of a column of air may be without appreciable influence on the static diffusion of the atmospheric carbon dioxide. Herein lies the explanation of the great efficiency of the stomata of a green leaf in accelerating the interchanges of gases and water vapour necessary for the requirements of the plant.

Mention cannot be made here of many other points referred to in the paper, which is even of more value for its stimulative suggestions than for the actual results described.

TUNGSTEN WITHIN THE EMPIRE.*

SYDNEY J. JOHNSTONE.
(Scientific and Technical Department, Imperial Institute.)

GREAT BRITAIN AND BRITISH INDIA.

Tungsten is certainly one of the most important of the rarer elements, if only on account of its use for hardening steel, the demand for this purpose having increased enormously since the outbreak of war. In amounts from 2 to 8 per cent. it imparts hardness, toughness and tensile strength to steel, and so renders it suitable for the construction of armour plate, projectiles, and firearms. When further quantities, up to 15 per cent., are used, the resultant steel is self-hardening, retains its temper and hardness at high temperatures and for this reason is invaluable for high speed tools, enabling them to be run red hot.

Before the war, very little tungsten was smelted in the United Kingdom although a large proportion of the world's production was raised in the British Dominions. Germany was then the controlling factor in the European tungsten market as she smelted from 30 to 40 per cent. of the world's output, although her own production of ore was insignificant. Shortly after the outbreak of war a large plant for smelting tungsten was erected at Widnes, and a firm at Luton, which had previously worked on a small scale, increased its capacity very greatly.

In addition to the above highly important uses of tungsten and its ferro-alloy, the metal is also employed for making electric lamp filaments. For this purpose it must be of great purity and is usually required in a ductile condition. The production of the metal in this state was not carried out on a commercial scale from the ore in the United Kingdom before the war, but it is now being produced in quantity more than sufficient to meet the demands of the British electric glow lamp industry. Before the war, ductile tungsten filaments were produced in this country, but the starting point was imported pure tungstic oxide, tungsten rod or coarse wire.

* Based on a lecture entitled "The Rarer Key Minerals" delivered at the London School of Economics, November, 1917.

Tungsten has also been employed to replace platinum in electrical contacts for magneto coils, signal relays, etc. Salts of tungsten are employed in the preparation of magenta bronze, for fire-proofing textile fabrics, as a mordant for dyeing cotton and silk, and for imparting a yellow colour to glass and porcelain.

For use in the steel industry tungsten ore is usually smelted by one of two general methods which are known as the soda and electro-thermic processes respectively. The former process is being employed on a large scale in the United Kingdom and is claimed to yield a product carrying a minimum of 98 per cent. of tungsten and 0·2 per cent. of carbon, the average content of tungsten being 98·5 per cent. It is claimed that this is quite 1 per cent. better than the product brought from Germany before the war. In the second type of process, the final product is ferro-tungsten, the reduction being effected either by the Thermit process or in the electric furnace. The latter method has been used recently in the United Kingdom and in Canada with considerable success.

Tungsten was known as a metal for over a century before any industrial use called for large supplies of its ores. The name tungsten, which was first applied to scheelite, is Swedish and means "heavy stone." In the middle ages tungsten ores were a source of trouble to the tin miners of Cornwall and Saxony as the separation of tin and tungsten ores was difficult owing to both having nearly the same specific gravity. The ore was, therefore, regarded as an objectionable impurity. Recently the dumps of certain old tin mines have supplied much valuable tungsten ore.

The two chief ores of tungsten are wolframite and scheelite, and a third, hübnerite, is raised in small quantities in the United States. Wolframite is a tungstate of iron and manganese, containing, when pure, about 76·3 per cent. of tungstic oxide, WO_3. Scheelite, a tungstate of calcium, contains up to 80·6 per cent. of the oxide, but is liable to contain molybdic oxide, which is said to be very objectionable if the metal extracted is intended for use in the manufacture of electric lamp filaments.

United Kingdom.—Most of the tungsten ore produced in the United Kingdom is wolframite and is raised in Cornwall, only a few tons being obtained from Devon and Cumberland; a small quantity of scheelite is also mined in the latter county. The majority of the tungsten producing mines in the United Kingdom are operated for their tin, the tungsten ore being only a by-product. Thus, during 1914, the recovery of wolfram from the South Crofty and East Pool mines of Cornwall was 3·63 and 2·95 lb. of wolfram per ton of tin ore mined. The Cornish deposits occur in four well-defined districts, the most important of which lies between Scorrier and Camborne, the chief producing mines in the district being the East Pool, South Crofty, and Tincroft. In the district extending from Kit Hill to Gunnislake tungsten ores occur in the granite masses of Kit Hill and Hingston Down. About 580 tons of ore was produced during seven years from the Hingston and Clitters United mines. The St. Austell granite area has also yielded considerable quantities of ore. In Devonshire, the mines which have yielded wolfram adjoin those of the Gunnislake area of Cornwall. The largest output appears to have come from the Bedford mine, which produces about 3 tons per annum. In the north-eastern portion of Bodmin Moor, alluvial wolfram has been mined on a small scale for some years. According to the Geological Survey, the probable annual output of tungsten ore from Cornwall and Devon in the immediate future, may be estimated at 373 to 500 tons, the total quantity to be obtained from 18 mines. This

estimate is based on the assumption that the price of tin does not fall much below £90 per ton and that the working costs of the tin mining do not increase. The quantity produced in 1916 is the largest recorded since 1873 and its value at the mines is only approached by that of the output of 1907 which was £41,044 for 322½ tons of ore. Tungsten ore being one of the substances not separately recorded in the accounts of the Board of Customs and Excise, no official returns are available of the quantities of tungsten ore imported into and exported from the United Kingdom.

*Tungsten Ore Production in the United Kingdom.**

County	1913		1916	
	Quantity	Value	Quantity	Value
	Tons	£	Tons	£
Cornwall †	179·9	17,483	355§	43,642
Cumberland ..	—	—	30	4,500
Devon	2·5	—	9	1,557
	182·4	—	394§	49,699

* *Home Office, Mines and Quarries, Pt.* 3, 1913–1916.
† Average content of tungstic oxide, 1913, 60%; 1916, 61%.

India.—The Tavoy district of Lower Burma produces more tungsten ore than any other locality in the world. Prior to the war most of its ore was shipped to Hamburg; now the whole output is sent for treatment to the United Kingdom. Owing to various causes the tungsten ore industry in Burma did not respond for some time to the demand made by the British Government for increased output, but late in 1915 active steps were taken to increase production by improving conditions of labour, transport, tenure, and with satisfactory results. A fixed price for the mineral was also guaranteed over a certain period, superintendents were appointed to work mines lying idle, and more labour was brought into the district, Chinese and Telegus being imported, the Burmese not taking kindly to the hard work of mining.

Wolfram was known to occur in Burma as long ago as 1841, but the production was not taken in hand seriously until 1909. Mining is now being carried on at over 50 mines within an area 32 miles south of the town of Tavoy to 40 miles north, the width of the belt averaging about 28 miles. Prospecting of the deposits is much hampered by the rains from May to November, when the rainfall averages 200 in. Moreover, the country is very rough and covered with dense jungle; up to 1914 there was only one metalled road in the whole district. The ore occurs chiefly in quartz veins, which also carry columbite, tourmaline, molybdenite, and, occasionally, tinstone. Many of the workings have gone but a short distance below the surface, and most of the mining has been done by adits. In the past the plant has been somewhat primitive, crushing being done largely by hammers, and the concentration by cradles. It would appear that the Hermingyi mine, which produced about 1000 tons of concentrates in 1917, is the largest tungsten ore producing mine in the world. According to recent statements the wolfram industry of Burma is capable of further considerable expansion providing that sufficient encouragement is given to the producers.

§ According to a competent authority, these figures probably include imported ore sent to Cornwall for concentration, and allowance must be made for duplicated returns. The actual U.K. production for 1917 is estimated at about 180 tons.—Ed.

The result of the energetic action of the Imperial Government as regards the working of the wolfram deposits of Burma is well shown by the following statistics published by the Geological Survey of India :—

Production of Tungsten Concentrates in India.

	1913		1916	
	Quantity	Value	Quantity	Value
	Tons	£	Tons	£
Burma ¶				
Tavoy	1,399	104,809	2,690	366,428
Mergui	205	17,092	528	53,566
S. Shan States ..	84	5,861	428	29,277
Thaton	—	—	73	10,115
Central Provinces				
Nagpur	—	—	1	220
Rajputana				
Marwar	—	—	33	6,358
Bihar and Orissa				
Singhbhum ..	—	—	8	640
Total	1,688	127,762	3,761	466,604

The output from Nagpur in 1916 was obtained by treating old dumps and efforts made to locate workable deposits were unsuccessful.

Wolfram has been found in many other localities in India but most of the occurrences so far proved have been small. A promising deposit occurs in Rajputana at Degana on the Jodhpur-Bikaner Railway.

The following tables show the quantities of tungsten concentrates raised in the British Empire and in the world during the years 1913 to 1916. The quantities have been reduced to a uniform basis of ore containing 60 per cent. of tungstic oxide :—

*Tungsten Ore Concentrates produced within the British Empire.**

	1913		1916	
	Quantity	Value	Quantity	Value
	Tons	£	Tons	£
United Kingdom ..	182	17,483	394	49,699
India	1,688	127,762	3,761	466,604
Fed. Malay States†	207	—	515	—
Unfed. Malay States:				
Trengganu ..	83	—	271	—
Kedah	29	—	17	—
Johore	—	—	23	—
Queensland‡ ..	358	35,367	335	—
Northern Territory	11	—	—	—
New South Wales	169	17,494	264	44,882
W. Australia § ..	1	86	4	566
Victoria	0·6	49	1	100
Tasmania	68	7,040	86	—
New Zealand§ ..	221	22,933	266	49,070
Union of S. Africa	—	—	—	252
Rhodesia	4	427	2½	466

* From Official statistics.
† Quantity exported not including re-exports.
‡ These figures are for wolfram and scheelite. There was also produced mixed concentrates containing bismuth and wolfram, the production of which amounted to 182, 193 and 247 tons respectively in 1913 to 1915 inclusive.
§ Exported.

¶ It is authoritatively stated that although some of the Burma ore is sufficiently free from tin, the figure for the Burmese production is too high by 15-20%, owing to much of the shipped concentrates containing tinstone. The concentrates from the Hermingyi mine contain an average of about 40% tungstic oxide and 30% of tin. The 1,000 tons of concentrates from this source produced about 570 tons of wolfram concentrates at about 70% WO_3, equivalent to 670 tons on a 60% basis.—Ed.

*World's Production of Tungsten Ores.**

Country.	1913	1914	1915	1916
	Metric Tons	Metric Tons	Metric Tons	Metric Tons
N. America				
United States ..	1,397	900	2,120	6,790†
S. America				
Argentine ..	539	394	171	700†
Bolivia	564	276	793	920†‡
Peru	300	196	371	400†
Europe				
England	182	205	360	350†
France	245†	200†	200†	200†
Germany-Austria	150†	220†	250†	300†
Portugal	800	967	1,400†	1,600†
Spain	150	84	511	600†
Asia				
Burma	1,732	1,868	2,883	4,123
Siam	281	30	297	468
Japan	297	195	439	1,150†
Australasia				
Queensland ..	543	435	640	509
New South Wales	209	220	100	320
New Zealand ..	270	250	249	300†
Total world's production	10,000	8,000	12,000	19,000
British Empire's production	29 %	29 %	35 %	30 %

* From "The Mineral Industry in 1916."
† Estimated.

CHEMICAL ENGINEERING.

A well-attended meeting of members of the Society, chemical manufacturers, engineers and others interested in chemical engineering, convened by Prof. J. W. Hinchley, was held in London on July 29. After Prof. G. T. Morgan had been elected to the chair, Prof. Hinchley outlined the steps that had been taken prior to the meeting to develop the scheme that was to be submitted to those present through the following resolutions:—

I. "That a Group be formed for the promotion and study of chemical engineering." Proposed by Prof. Hinchley, seconded by Dr. Ormandy. II "That a Committee be elected, with full power to act, to draft rules and to meet the Sub-committee appointed by the Council of the Society of Chemical Industry, with a view to this Group becoming a Section or Group of the Society of Chemical Industry." Proposer, Capt. C. J. Goodwin; seconder, Mr. F. H. Rogers. III. "That the activities of the Group be under the control of a Committee and Officers elected under rules similar to those of local Sections of the Society of Chemical Industry." Moved by Dr. H. J. Bush, seconded by Mr. A. J. Liversedge. IV. "That a special subscription be levied to cover the cost of organisation and work of the Group, and particularly that of printing and posting of papers prior to their being read." Proposed by Mr. Brewis and seconded by Mr. Little. V. "That one of the objects of the Group be to promote vigorously chemical engineering research." Proposed by Mr. C. E. Sage and seconded by Mr. N. A. Anfilogoff. In supporting the last resolution, Mr. L. G. Radcliffe, of the Manchester Section of the Society, expressed the strong interest of the Manchester technologists in the future development of chemical engineering education, industry and research.

‡ The actual Bolivian production was over 3000 tons in 1916, and nearly 4000 tons in 1917.—Ed.

The resolutions were all carried unanimously.

After the election of a temporary Committee in accordance with resolution II., a discussion took place as to the amount of the special subscription to be leviable in addition to the ordinary annual subscription to the Society. A proposal moved by Mr. C. S. Garland and seconded by Mr. Anfilogoff to fix this at one guinea per annum was carried by a substantial majority.

In reply to queries, Prof. Hinchley sketched the proposed work of the Group, which is to consist *inter alia* in arranging frequent conferences at various centres throughout the country, at which papers will be read and discussions take place on the more important problems and operations of chemical engineering, particular regard being paid to the branch of industry of most local importance. It is proposed that the Chemical Engineering Group should occupy the position of a "subject section" of the Society of Chemical Industry, as opposed to a territorial section, and that members of the Society should be *ipso facto* eligible for membership of the Group. It is intended that the views expressed at these special meetings shall be fully representative of the latest knowledge and experience in the subjects under discussion, so that the pronouncements of such meetings, with certain obvious limitations, shall be authoritative. Dealing with the subject of research in chemical engineering, Prof. Hinchley intimated that it was the intention of the Group to begin a vigorous campaign to promote original investigation in technical colleges and schools, and also in works, as he believed adequate financial backing to such a programme could be obtained if a responsible and fully accredited body were charged with its supervision and general organisation. Most of the speakers deplored the backward state of research work of this kind in the United Kingdom, and the meeting was very strongly in favour of energetic measures being taken to establish chemical engineering education and research on a satisfactory and progressive basis.

The following were elected to serve on the Committee of the proposed Group, and to elect a Sub-committee in accordance with resolution II.:—

Prof. J. W. Hinchley, Capt. C. J. Goodwin, Drs. W. R. Ormandy, H. C. Greenwood, H. J. Bush, and Messrs. C. S. Garland, A. J. Liversedge, F. H. Rogers, E. A. Alliott, and H. Talbot (Hon. Sec.).

Until the Sub-committee shall have completed its work and the decision of the Council on the question of the Chemical Engineering Group becoming a "subject section" of the Society shall have been made known, the suggestions put forward and arrangements made are to be regarded as provisional only, but the enthusiasm of the meeting was such as to indicate that a very distinct want would be supplied by the inauguration of some such organisation as that contemplated. In the meantime, all who are interested can receive any desired information from Prof. Hinchley, at the Imperial College of Science and Technology, South Kensington, London, S.W., or from the Secretary, at 15 New Bridge Street, London, E.C. 4.

National Association of Industrial Chemists.—At a recent meeting of the London Section of this Association, the President, Mr. A. C. J. Charlier, announced that eight local Sections had been formed with a total strength of over 800. Excellent progress had been made at Manchester, Birmingham and Sheffield, where practical Trades Classes had been arranged for. In response to official inquiries, the Association had been able to secure valuable appointments for some of its members.

MEETINGS OF OTHER SOCIETIES.

ROYAL SOCIETY OF EDINBURGH.

At an ordinary meeting held on July 8, Dr. J. Horne in the chair, Dr. W. W. Taylor presented four communications. (1) "The Rotatory Commutator Method of determining Electric Conductivity and an improved form of MacGregor's Drum." This drum is a double reversing key, reversing the current continuously so as to make it alternating through the electrolyte, and readjusting it so as to make it continuous through the galvanometer. It is well known that with the usual form of drum the apparent resistance varies with the conditions, such as the rate of rotation, and differs slightly from the value obtained by the Kohlrausch method. These defects are due to the construction of the drum, and by a simple modification the defects have been overcome. (2) "The Solubility of Insoluble Salts and of Silver Oxide." There are large discrepancies between the solubility of these substances as determined by chemical analysis and physical methods. The chemical methods give always the greater values, owing to the presence of "sols" of the substance in addition to the true solution. In the case of silver oxide a yellow brown solution was on one occasion obtained containing less oxide than in a similarly prepared colourless solution. Similarly the increased solubility of insoluble salts in presence of substances like starch is to be attributed to the protection of the sol by the emulsoid and not to adsorption at the interface. (3) "The Electric Conductivity of Sols." A series of determinations of the electric conductivity of Kohlschutter's silver sol led to the conclusion that the small limiting conductivity is dependent on the electrolyte impurity derived from the substances employed in the preparation of the sol. (4) "The Titration Acidity of Urine." In the estimation of the acidity of urine by titration with alkali and phenolphthalein, potassium oxalate is added to remove the calcium which interferes with the end-point. Experiments show that the end-point is the same in the absence of the oxalate, though perhaps it is not quite so easily fixed. The addition of neutral calcium chloride is found to increase the acidity to a certain definite extent, and this increased acidity is removed by neutral potassium oxalate. It has not yet been ascertained to what constituent of the urine this is due.

THE FARADAY SOCIETY.

The first paper read at the meeting held on July 23 at Burlington House, W., with Sir R. Hadfield in the chair, was by Mr. J. G. A. Rhodin on "Contributions to the Chemistry of Aluminium Alloys." Working with large quantities of scrap aluminium alloy, the author had attempted to obtain a method by means of which it could be readily sorted, and he had found that, with the usual amounts of copper and zinc which are present in commercial alloys, this grading was made possible by determining the density of the alloy. The quality of remelted scrap had also received considerable attention, especially with regard to the amount of oxide which it contained. The author described a method by which both aluminium and its oxide could be estimated directly, which depended on the fact, assumed to be correct by the author, that while aluminium itself is soluble in 10 per cent. caustic soda solution, the oxide is not, but will dissolve in nitric acid of sp. gr. 1.2. A number of determinations of the oxide content were given for various alloys, but unfortunately, in every case, about 5 per cent. of the alloy was not estimated. Experiments on the heating of finely divided aluminium powder in air were also described, which indicate that considerable oxidation takes place. The samples, however, did not attain a constant weight after long periods of heating, and no definite conclusions as to the nature of the oxide which was formed could be arrived at. Other experiments were described in which aluminium and alumina were "thermited" in a quartz crucible, with the production of "a new chemical body, consisting of a mass of graphite-like crystals." In an appendix the author described experiments on the burning of aluminium in air. Fine powder, on ignition, increases in weight until it has the composition Al_2O. On treating this product with 10 per cent. caustic soda solution, a considerable portion dissolves, leaving a product which has the composition, Al_3O_4. The author considers that aluminium burns in air to the compound Al_3O_4, just as iron burns to Fe_3O_4, but as Al_3O_4 is soluble in aluminium, it can only be obtained after removing the excess of metal with alkali.

Dr. W. Rosenhain, who opened the discussion, referred to the great value of any method of estimating oxygen in aluminium which could be relied on to give accurate results. He mentioned results obtained at the National Physical Laboratory, using aluminium powder, in which 20—30 per cent. of oxide had been formed by heating it in air, but he considered that this was merely due to the surface oxidation of finely divided particles. He did not consider it probable that the oxides of aluminium were soluble in aluminium to any large extent, but suggested that this could be determined by measurements of the melting point.

Mr. Vautin exhibited a sample of a black powder which he described as a very active form of aluminium. On applying a match to this powder a fairly vigorous reaction took place, the whole mass becoming red hot, which was followed by a still more vigorous reaction in which the powder was raised to incandescence. The first stage he described as the oxidation of the aluminium to Al_2O, which subsequently oxidised still further to Al_2O_3. The powder contained 70 per cent. of aluminium, together with small quantities of Al_2O_3 and a hydrate.

Dr. Seligman doubted the accuracy of the author's facts in regard to the solubility of alumina in nitric acid of the strength mentioned in the paper, and criticised the experimental methods adopted.

Dr. Gwyer agreed with Dr. Seligman, and pointed out that all the author's analyses added up to 100·00. He would like information as to the constituents which were estimated by difference.

Mr. Waterhouse referred to a Goldschmidt process for the manufacture of Al_2O, by the action of aluminium on alumina.

Mr. Girtin spoke in appreciation of the author's method from a practical standpoint.

A paper by Robert J. Anderson, on the Metallography of Aluminium, described the formation of large grains in aluminium as a result of annealing after varying amounts of deformation. He concludes that aluminium is similar to other metals as regards annealing laws. Dr. Seligman, in the discussion on this paper, was able to confirm the author's results, and he exhibited some samples of coarse-grained aluminium.

Dr. Rosenhain stated that this subject seemed to be "in the air" at present, as he knew of at least two other papers of a similar nature which were before the publication committees of scientific societies. The subject had been investigated at the National Physical Laboratory over two years ago.

Mr. H. J. M. Creighton presented a paper on "Reinforced Concrete *versus* Salt, Brine, and Seawater," in the course of which he described

numerous cases of the failure of reinforced concrete structures under the action of water containing dissolved salt, due to electrolytic action between the salt and the reinforcements.

A striking example of the deterioration of marine reinforced concrete is to be found in Young's "Million Dollar" Pier at Atlantic City, New Jersey. At the end of two years after its completion, some of the piles commenced to disintegrate owing to the corrosion of the reinforcements. The disintegration proceeded so rapidly and the structure became so weakened, that in the winter of 1912 a large portion of the pier was swept away by a storm.

At the Key West extension of the Florida East Coast Railway, one of the steel reinforced concrete viaducts was found to have undergone extensive deterioration within two years after its completion, and in consequence, since 1909, all viaducts have been constructed without reinforcings, and with a cement low in magnesium and sulphuric acid and finely ground.

According to a recent report by J. L. Harrison, District Engineer, Iloilo, the cracking of reinforced concrete structures is markedly prevalent in the Philippine Islands. A study of this trouble has demonstrated that not a single structure showing rusted steel has been free from salt, the percentage of which varies considerably. In view of this, engineers in the Philippines have been advised that not only is the use of salt water dangerous in concrete structures, but that beach sand and beach gravel should be employed only after having been thoroughly washed with fresh water.

The author considers that the permanence and durability of reinforced concrete ships is a matter of considerable doubt, unless sea-water is prevented from coming into contact with the reinforcements. Such treatment may consist of painting the reinforcements, or waterproofing the concrete, but most of the substances which have been used for these purposes are far from satisfactory. The use of the Schoop Metal Spray Process is suggested as being suitable. Cement for ship construction should be made from cement of fine pulverisation, low in alumina and high in silica, as free as possible from gypsum, absolutely free from lime, slow in setting and quick in hardening.

PERSONALIA.

Prof. T. W. Richards, professor of chemistry at Harvard University, U.S.A., has been elected a foreign member of the Accademia dei Lincei, Rome.

Dr. G. Senter has been appointed principal of the Birkbeck College, London, W.C., in succession to Dr. G. Armitage-Smith, who filled the position for over twenty years.

The services of Dr. T. Gray, Professor of Technical Chemistry at the Royal Technical College, Glasgow, have been lent to the Fuel Research Department of the Government, of which Sir George Beilby, chairman of the Governors, is director.

The governors of the Royal Technical College, Glasgow have appointed Dr. C. H. Desch to the Chair of Metallurgy in the College, rendered vacant by the resignation of Prof. A. Campion. Dr. Desch, who is of English parentage, has been "Graham Young" Lecturer in Metallurgy in Glasgow University for the last ten years.

Mr. Francis Henderson, shipowner, has subscribed £1000 to the Sugar Research Fund being raised by the Royal Technical College, Glasgow.

The following have passed the July examination for the Associateship of the Institute of Chemistry:—W. H. Craven, B.Sc. (Lond.), in organic chemistry, and Ella Caird in the chemistry of food and drugs.

NEWS AND NOTES.

AUSTRALIA.

Mineral Production in New South Wales.—The value of the mineral output in 1917 was £12,952,719, or nearly £2,000,000 greater than in 1916. This increase was largely due to greatly enhanced prices, but silver-lead, coal, copper and tin mines all showed increased outputs; gold showed a decrease. The following were the values for some of the smaller industries:—Scheelite, £23,419; wolfram, £21,682; molybdenite, £31,608; bismuth, £9391; alunite, £10,728; platinum, £2072; and Portland cement, £347,381.—*(Bd. of Trade J., July* 4, 1918.)

CANADA.

The Quebec Gold Fields.—Considerable staking of gold-mine claims has taken place in the north-western part of the Province of Quebec, a few miles east of the inter-provincial boundary. The stakings include, in addition, a considerable strip of mainland and several islands in a lake about 10 miles south of Lake Abitibbi, and are easily accessible by canoe from Lowbush, Nipissing.

Copper and Nickel in Quebec.—One of the largest deposits of nickel and copper ore so far found in the district has been discovered in the Upper Notch of the Eardley Mountains, three miles from Luskville, Quebec. The discovery was made some time ago by a veteran prospector who is over 70 years of age, but it was only recently that he mentioned it, and he then took another man with him and they dug down about 5 ft. in several parts of the property. Everywhere they found ore rich in nickel and copper and no trace of rock.

Canadian Pine Oil.—Until recently the oil used in the oil flotation process of mineral separation was "pine oil" obtained from the distillation of turpentine in the "hard" pine regions of the southern United States. According to the Canadian Department of Commerce this has now been discarded in favour of one of the creasote oils obtained in the distillation of wood. This "Canadian pine oil" is now being produced at the rate of 1200 gallons a day.

* * *

British Columbia Coal Output.—The coal output in British Columbia last year was the largest since the record year 1910. The total output reported was 2,712,335 tons, against 2,485,670 tons in 1916 and 2,800,046 tons in 1910.—*(Iron and Coal Tr. Rev., June* 21, 1918.)

Yield of Maple Products in Quebec.—The yield of maple products for 1918 will be at least equal to that of last season. The quality of the sap is good and the sugar content exceptionally high, about 1¼ lb. of sugar being obtainable from a bucket of sap, which is about 25 per cent. above the average. Prices opened high—about 20 per cent. per lb. for sugar, and $2 per gallon for syrup.—*(U.S. Com. Rep., May* 10, 1918.)

Lignite for Briquettes.—The Canadian Council for Scientific and Industrial Research intends to manufacture carbonised lignite briquettes. A plant costing about £80,000 will be constructed near Estevan, Saskatchewan. The proposal is to take 2 tons of poor lignite with about 32 per cent. of moisture and of 7300 B.Th.U. per lb., and turn them into 1 ton of briquettes containing 5 per cent. of moisture and having a fuel value of 12,000 B.Th.U. Sulphite liquor, the waste product from pulp mills, will be used as the binder; it is smokeless and odourless.—*(Iron and Coal Tr. Rev., July* 5, 1918.)

SOUTH AFRICA.

Oil Shale.—According to the "South African Mining Journal" a new oil-shale field is under development in the Wakkerstroom district. There is a cutting of 180 ft., and a shaft down 42 ft. Samples analysed in Johannesburg show a high yield of crude oil.

Report of State Mining Commission.—The Commissioners have recommended that, having regard to all the conditions which obtain in South Africa at the present time, they cannot advise that the Union Government engage in the mining of any minerals on its own account.

* * *

New Factories, etc.—A paint factory is being established near Huguenot Station, Western Province.

The manufacture of ink is shortly to be undertaken at Maritzburg.

The quantity of coke manufactured in Natal during 1917 is reported to have reached nearly 20,000 short tons. The imports fell from 23,000 tons in 1916 to 6700 tons in 1917.

A company with a nominal capital of £25,000 is being formed at Capetown to erect works for the manufacture of starch, blue, dextrine, glucose, maize oil, oil cake, industrial spirit, etc. The proposed works will be capable of dealing annually with 25,000 bags of maize, from which about 3 million lb. of starch should be extracted. In addition the following yields of by-products are expected: maize oil, 192,000 lb.; oil cake, 480,000 lb.; and liquid cattle food, 960,000 lb.

Wattle Extract.—This industry made considerable progress during 1917. The monthly output of the Maritzburg factory was increased to about 200 tons, and the Natal Wattle Products, Ltd., of Durban, working on a new process of treating the bark, has now entered the producing stage. Additional factories at Dalton and at Verulam are being established. The trial consignment of 50 tons of extract sent to India has been reported upon favourably, and inquiries for a further 150 tons are now being considered.

Cement Production.—The output of the Pretoria Portland Cement Company during the past year exceeded that of the previous year by 20 per cent. Two dividends of 20 per cent. each have been paid, and £50,000 added to reserve. Inevitable delays had somewhat retarded production, but everything is now proceeding satisfactorily, and the company will soon be able to cope with the heavy orders on hand for cement. The company is gradually extending its activities, and a second rotary kiln was brought into commission on April 15 last.—(*S. Afr. J. Ind., May,* 1918.)

UNITED STATES.

The Oxidation of Ammonia.—The Bureau of Mines in Washington has been conducting experiments with a view to determining the influence of acetylene on the oxidation of ammonia to nitric acid. It has been concluded that as little as 0·02 per cent. in the ammonia has a deleterious effect and reduces the yield of nitric acid from 95 to about 89 per cent. The effect of 0·1 per cent. brings the yield down as low as 65 per cent. Ammonia may be freed from acetylene and other non-reacting gases by dissolving in water and making a strong ammoniacal liquor.

The Use of Finely-ground Rock Phosphate as a Fertiliser.—Owing to the scarcity of sulphuric acid, due to the demand for munitions, there has arisen a serious situation in the production of phosphate fertiliser. The U.S. Bureau of Soils at Washington has been making extensive tests in the use of very finely ground phosphate rock, which has been the subject of more or less academic discussion for a number of years past. The conclusions reached are that many crops are increased by a liberal and even by a moderate use of the finely ground raw rock, even during the first year of its application, but that a greater effectiveness is likely to be observed after the year in which it has been applied. The presence of decaying organic matter increases the effectiveness of ground rock upon the soil. When early stimulation and quick maturity of the crop are the main considerations, acid phosphate is the best form in which to apply it. Field experiments, in which raw rock and acid phosphate are compared on the basis of equal applications of the two materials, result usually in favour of acid phosphate, particularly when the experiments are conducted over short periods.

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New Picric-acid Plants.—The pressing need for explosives is forcing the United States Government to rush forward the construction of two large picric-acid plants, one at Little Rock, Arkansas, the other at Brunswick, Georgia. The former is estimated to cost $4,000,000, and is expected to be ready by September of this year. The Brunswick plant is estimated to cost nearly $7,000,000. These are the first Government-controlled picric-acid works to be established in the United States.

Acetone from Kelp.—The requirements of the British Government have revolutionised the work of the Hercules Powder Company on the bay at Potash, near San Diego. This Californian company has, at a cost of $5,000,000, put down a plant to deal with the giant kelp of the Pacific Coast for the production of potash and acetone. The latter is now the chief product, potash and other materials produced, though of large tonnage, being regarded as subsidiary products. Among these ethyl propionate and ethyl butyrate are being produced on a scale never before approached. These solvents are especially valuable as substitutes for amyl acetate on account of the efforts now being made by the U.S. Government to conserve acetate of lime. The works cover 30 acres and give employment to 1,000 men. The acetone stands easily the stringent tests of the British specification. The quantity of kelp cut averaged about 24,000 tons a month in 1917.—(*Met. and Chem. Eng., June* 1, 1918.)

Nitrate Plants.—A somewhat serious view of the nitrate position appears to be taken in Birkenhead. In a recent sitting, Congress authorised the expenditure of a further $9,000,000 for the erection of a nitrogen-fixation plant at Indian Head, Md., for the manufacture of nitrates for the navy, in addition to the four large plants contemplated for army requirements at a cost of $90,000,000. Two of the army plants are to be established at Mussels Shoals, Alabama, and one each at Toledo and Elisabethport in Ohio. Secretary Daniels said that "the nitrate situation was one of the most important and critical of the whole war."—(*Oil, Paint and Drug Rep., June* 24, 1918.)

JAPAN.

The Dye Industry.—Since the outbreak of war the manufacture of artificial dyes in Japan has undergone rapid development. According to the latest Government report, the number of firms engaged in the manufacture is now eighty, and the total annual output exceeds 7,700,000 kin (kin = 1·29 lb.). This output is distributed as follows:—

Sulphur colours, 2,550,129 kin; aniline colours, 76,921 kin; miscellaneous, 234,685 kin; vegetable colours, 177,603 kin.

The names, places and capitals (paid up) of the more important firms are given in the following list:—

(i) *Aniline colours, except sulphur colours.*—The Nippon Dyestuff Co., Osaka, 3,260,000 yen; Yura Dyestuff Co., Wakayama, 700,000 yen; the Asahi Chemical Industry Co., Wakayama, 200,000 yen; the Toa Chemical Industry Co., Osaka, 210,000 yen; Kameido Dye Manufacturing Works, Tokyo, 107,000 yen; the Mitsui Mining Co., Fukuoka, 150,000 yen; Osaka Colouring Matter Research Works, 80,000 yen; Mitsuishi Co. Dye Works, Tokyo, 100,000 yen; Tokyo Chemical Industry Co., Tokyo, 71,000 yen; Suzuki Co. Dyeworks, Kobe, 50,000 yen; others, 143,000 yen.—Total, 5,011,000 yen.

(ii) *Sulphur colours.*—Yodagin Dyeworks, Okayama, 135,000 yen; the Teikoku Dye Manufacturing Co., Hiroshima, 100,000 yen; the Toyo Dyestuff Trading Co., Hiroshima, 100,000 yen; the Nippon Chemical Dyes Manufacturing Co., Tokyo, 100,000 yen; the Japan Colours Co., Kagawa, 50,000 yen; other companies, 231,000 yen.—Total, 716,000 yen. Grand total, 5,727,000 yen. (Yen = 2*s*. 0½*d*. normal, 2*s*. 2*d*. 1918.)

The chief varieties now on the market are the following:—

Aniline and aniline salt, black and brown sulphur colours, para-nitraniline, paramine brown, alizarine, alizarine blue, fast red, orange, metanil yellow, naphthylamine brown, Bismarck brown, methylene blue, methyl violet, Congo red, benzopurpurine, chrysophenine.

Of the intermediate products, naphthol, naphthylamine, carbolic acid, salicylic acid, amidonaphthol and dimethylaniline, etc., have passed through the experimental stage and are to be manufactured on a large scale forthwith.

The quantity of dyes imported from America has not diminished of late. The immediate future of the home industry will depend on the cost of manufacture, and on the supply of raw materials. At the present time these are in very short supply, the demand for carbolic acid in particular being very great.

Ultramarine.—The annual demand for ultramarine in Japan is now about 660,000 kin. This pigment was imported almost exclusively from Germany up to 1914, but when war broke out it was replaced by the American product, which, however, was very highly priced. Many attempts have been made to obtain the first quality pigment at a lower price, and not without success, as the following statistics of imports show:—

1915, 143,648 kin, 40,963 yen; 1916, 90,211 kin, 38,181 yen; 1917, 68,034 kin, 54,439 yen.

The home production is estimated to be at the rate of about 70,000 kin, which is still far below the actual demand. Market prices are:—

1·20 yen per kin for the Japanese product; 1·40 yen per kin for the American product; 2·00 yen per kin for the German product.

* * *

Asbestos Industry in Japan.—The asbestos industry in Japan has made enormous strides in recent years, and more particularly since the commencement of the war. In 1914, imports of manufactured asbestos goods were valued at about $63,500, whereas for the year 1917 they are estimated at nearly twice this value. Japan has also become an important manufacturer of asbestos goods on her own account, and it is in the purchases of crude material that the most surprising increases are shown. Thus, more than 5,500,000 lb. of crude asbestos were imported in 1916, as compared with only about 500,000 lb. in 1914. There are now eleven companies in Japan manufacturing various asbestos products, which are in great demand, not only for ordinary industrial purposes, but also to meet the greatly increased naval and general shipbuilding requirements. The domestic manufacture has now reached such dimensions that there is a growing export trade, and last year these exports exceeded in value the manufactured imports. Crude asbestos, in lump, powder, or fibre, enters Japan free, but there is an import duty on manufactured articles, ranging from $3 to $5 per 132 lb.—(*Canad. Min. Inst. Bull., June*, 1918.)

GENERAL.

Manufacture of Cellulose Acetate.—The Fifth Report of the Select Committee on National Expenditure contains a long and complex story of the efforts made by the War Office, the Admiralty, and the Ministry of Munitions to obtain a home supply of cellulose acetate, the chief constituent of "dope" for aeroplane wings. It is stated that in 1915, the Cellonite Company of Basle was given the contract to set up a factory in England, the War Office guaranteeing to refund the capital expenditure on plant up to a sum equal to 5 years' excess profits duty. Offers to manufacture were received, both then and subsequently, from other firms, but were declined, the Usines du Rhône (a French company which in the Committee's opinion makes a better material) being among the number. To erect works and to carry out the initial order for 100 tons of acetate, a private company was registered in March, 1916, with a nominal capital of £4000 (in 6*d*. shares), and £120,000 debentures were raised without Treasury sanction. In March 1918 this Company was converted into The British Cellulose and Chemical Manufacturing (Parent) Co., Ltd., with a share capital of £3,500,000 in £1 shares (this J., 1918, 142 R), of which some 455,000 were paid for in cash. The bulk of the remainder was exchanged with the original shareholders on the basis of 14½ £1 shares for each 6*d*. share held in the old.

According to the Report, there have been many and serious delays in output, little or no supervision has been exercised either over the capital expenditure (estimated at about £3,500,000 in May 1918) or over the efficiency and economy of manufacture, and complaints have been made as to the quality of the output. The agreement to refund the capital expenditure was cancelled in June last, but owing to it and to the refusal to consider alternative offers of manufacture in 1917, the company is in possession of a complete monopoly. The Committee recommends the Government: to take over the factory at once; to appoint a Technical Committee to advise concerning the completion of the factory and its efficient management, and to secure an alternative source of supply. In a letter to the Press, the secretary of the Company asks that judgment may be suspended until the whole of the facts can be made known. The matter has been the subject of inquiries and debate in Parliament, and the Government has invited Lord Sumner (Chairman), Lord Incheape, and Lord Colwyn, to form a Court of Inquiry to investigate the whole question.

The Report also states that the Munitions Inventions Department is investigating the possibility of manufacturing cellulose acetate without acetic anhydride, which is the most costly of the constituents; that further economies could be effected by the use of ethyl formate as a solvent instead of methyl acetate, since for the former imported materials are not required; and that experiments at the Royal Aircraft Factory in the production of a pigmented dope may result in the elimination of varnish.

Chemists and Labour Exchanges.—At recent meetings of chemists the complaint has been voiced that, in official advertisements for appointments, candidates are asked to "apply to the nearest Labour Exchange." To obviate this seeming indignity the Registrar of the Institute of Chemistry has recently addressed a letter to the Secretary of the Board of Trade Labour Exchanges, asking if it

is still necessary, under the Defence of the Realm Regulations or any other Order, that professional chemists should be engaged through the Exchanges. The reply received concedes the point asked for. "The Minister does not in practice raise objection to the publication in the usual manner of advertisements relating to higher staff appointments," and therefore it is not necessary that applicants should be referred to an Employment Exchange. This concession, however, is not to apply to advertisements for subordinate laboratory appointments which do not demand definite professional qualifications.

TESTING OF SCIENTIFIC GLASSWARE.—After consultation with the Ministry of Munitions and the Department of Scientific and Industrial Research, and in conjunction with the British Chemical Ware Manufacturers' Association and the British Laboratory Ware Association, the National Physical Laboratory has made arrangements for the testing of scientific glassware on a comprehensive scale. The tests will include (*a*) Volumetric tests of all kinds of graduated vessels; (*b*) tests on resistance to chemical actión, and as to the general suitability of vessels for use in chemical processes; (c) tests of filter paper, porcelain ware, etc., as used in chemical and physical laboratories. The volumetric tests are subdivided as follows:—(I.) Examination of vessels of the highest accuracy. (Class A Tests.) (II.) Inspection of glassware of commercial accuracy. For the present the vessels must be sent to the Laboratory (Metrology Department), but it is intended to establish a central collecting depôt in London in the near future. In a pamphlet recently issued by the National Physical Laboratory, directions for packing and addressing are laid down, together with instructions concerning the cleanliness, construction, graduation marks, and inscriptions on the vessels to be submitted. A schedule of fees for the Class A Tests is appended.

PRODUCTION OF FUEL OIL IN THE UNITED KINGDOM.—The question of the production of fuel oil from home sources has been investigated by a Committee appointed by the Minister of Munitions, and under the Chairmanship of the Marquess of Crewe. The report, just issued, states that the best method is the carbonisation of cannel coal in existing vertical retorts at gasworks, although no very largely increased quantity of oil can be obtained from this source during the war owing to difficulties of labour, coal transport, etc. The Petroleum Research Department had recommended the erection of batteries of a form of low temperature retort for the carbonisation of cannel coal, but an experimental investigation of low temperature processes by the Ministry has proved that the suggestion was impracticable, on the grounds of expense, shortage of labour, time involved, and the fact that the mineral is not available in the quantities which the first investigations indicated.

The Committee indicates other sources of supply as available in the future. These sources include boring for oil in Great Britain, the further development of the Scottish shale oil industry, and the increased carbonisation of raw coal. In this latter connexion the report states that some $1\frac{1}{2}$ million tons of fuel oil might be obtained from every 20 million tons of coal carbonised.—(*Bd. of Trade J., Aug.* 1, 1918.)

TUNISIAN ALFA GRASS.—The common terms Alfa (from the Arabic "halfa," a fibre) and esparto (Lat. "spartum") include three distinct varieties of gramineous plants—diss, *Ampelodesmos tenax*; esparto, also called sennoc or albardin, *Lygeum Spartum*; and the true alfa, *Stipa tenacissima*. Alfa grass flourishes over a wide area of Northern Africa and Spain. In Tunisia it is estimated to cover an area of 5,000,000 acres. Only in Spain is it actually cultivated, elsewhere growing wild.

Alfa flourishes on hot, dry tableland with pervious subsoil. The leaf, which is the valuable portion, has an average length of 20 to 30 inches. The leaf grows flat, but curls to a hard, dry cylinder under the influence of the hot African sun. It is gathered in July, and, after being separated from the stalk, it is dried for three to five days, and then transported to the buying station, where it is graded, weighed, and baled under pressure.

The following figures show the exports of alfa grass from Tunisia in recent years: 1913, 49,319 tons; 1914, 57,670 tons; 1915, 32,333 tons; 1916, 23,932 tons. Practically the whole of this was sent to Great Britain, and the decrease is explained by the British restrictions on imports and high freight charges, which now exceed the cost of the alfa.

Alfa finds considerable use in the domestic industries of Tunisia, but its main importance lies in its use in the British paper trade. English imports amount annually to 205,000 tons, 100,000 tons coming from Algeria, 45,000 tons from Spain, 30,000 tons from Tunisia, and 30,000 from Tripoli, representing 92,250 tons of paper pulp.

Alfa is not worked up to paper pulp in Africa owing to lack of the necessary raw materials. A chemist in Tunis claims to have invented a new process of pulp making which includes a special method of retting, followed by a caustic bath at a low temperature and without pressure, using 50 per cent. less caustic than the standard English process. It is stated to be cheaper and less exacting to the fibre.

Alfa can also be transformed to a jute-like textile by an improved method of removing the gum from the fibre. Experiments on the manufacture of binder twine have not met with success, owing to the weakness of the material.—(*U.S. Com. Rep., April* 3, 1918.)

ORE PRODUCTION IN TUNISIA.—Statistics for 1917 show the following output of ores:—Lead, 41,400 tons; zinc, 15,000 tons; iron, 606,000 tons; manganese, 5800 tons; phosphates, 1,000,000 tons; lignite, 32,700 tons, representing a total value of nearly £3,000,000. The output of phosphates would have been much greater but for difficulties of export.—(*U.S. Com. Rep., May* 21, 1918.)

COFFEE SUBSTITUTES IN DENMARK.—During 1916 the six factories making coffee substitutes consumed the following materials:—Soya beans, 750 tons; dried chicory roots, 3411 tons; dried sugar-beets, 654 tons; rye, 706 tons; cacao shells, 298 tons; maize, 62 tons; dried malt, 23 tons; and oats, 16 tons.—(*Chem.-Zeit., May* 8, 1918.)

HEATHER AS FODDER.—The manufacture of a fodder from heather has become an important industry in Denmark. The Danish methods are based upon the results obtained in German works. The heather is ground to a kind of flour and mixed with blood from abattoirs; this mixture is now being used by Danish farmers as a cattle food in place of oats. It is believed that this new industry is more than a temporary war measure, and that it will prove of permanent value.—(*U.S. Com. Rep., May* 21, 1918.)

SUBSTITUTES FOR MANGANESE.—The need for a sparing use of manganese in steel manufacture at the present time is making itself felt in all countries. An official of the Stavanger Steelworks in Norway directs attention to a source of manganese not yet utilised, namely, the slags from spiegel furnaces. These contain a fairly large proportion of manganese. They would be self-fluxing in the blast-furnaces, and much of their manganese content would be saved. Spiegeleisen of quite low grade can effectively replace ferro-manganese in most steels, and calcium carbide may be partly substituted for ferro-manganese in deoxidising steel.

According to a calculation, 10 to 12 per cent. of spiegel, or even 8 to 10 per cent., can replace ferro-manganese entirely in all grades of rail steel. The spiegel should be melted in an electric furnace to preserve the manganese and keep down the carbon, and not in cupolas. The necessary silicon can be added in the form of ferro-silicon.—(*Iron Trade Rev., June* 13, 1918.)

German Coal Industry and the Labour Supply.—The authorities in Germany have apparently recognised the unwisdom of withdrawing labour from the coal industry. According to official statistics for the last quarter of 1917, the number of workers employed in the Silesian and Dortmund mining districts was 472,953, compared with an average of 412,381 for the year 1916. The numbers for the same periods in the districts of Saarbrücken, Aachen, and the left bank of the Rhine were 67,514 53,527. In the lignite mining districts the figures given are 47,860 and 39,986 respectively.—*Z. Berg-Hütten u. Salinenwesen,* Heft 1, 1918.)

Possibility of a Chemical Industry in Turkey.—At the present time, chemical industry may be said to be non-existent in Turkey. There is only one sulphuric acid works, and this is engaged exclusively in supplying the State powder factory in Makri-köy. In the past, a few articles like toilet soap, perfumed waters, and vegetable dyes have been manufactured on a small scale, but more recently, owing to the impetus given by the war, cotton wool, iodine and quinine factories have been started, and imitations of foreign cosmetic and pharmaceutical preparations have been taken in hand. Conditions for the establishment of a sulphuric acid industry are unfavourable. Raw materials available include salt, petroleum, phosphate, boracite, bromides, opium, colocynth, liquorice and dye-plants. Lack of coal resources will make it very difficult to establish chemical industries, and for the same reason the natural salt deposits cannot be utilised for the manufacture of soda. If the Dead Sea could be brought into the Palestine Railway system, chemical industries could be established where raw materials such as phosphates, bitumen, etc., are found. Hope lies mainly in two directions: development of perfumery, tanning and dyeing materials, and in soap manufacture.—(*Z. angew. Chem., June* 14, 1918.)

Utilisation of Anthracite Culm.—The coal department of the Delaware, Lackawanna and Western Railroad Co. has succeeded in burning anthracite culm under boilers by means of a chain grate stoker and forced draught. The heat obtained is intense but not as flexible as with other stokers and bituminous coal, and considerable care and skill are required for handling the fire.—(*American Coal Age, June* 1, 1918.)

American Regulations to Prevent "Dirty" Coal Supplies.—A series of regulations to enforce the production of clean coal became effective throughout the United States on June 1. No bituminous coal will be permitted to be sold, shipped or distributed if it contains such quantity of rock, slate or other impurities that it would not have been considered merchantable prior to January 1, 1916. Shipments from bituminous coal mines in which the coal is naturally of such character as to be unfit for market may be prohibited by the Fuel Administrator. If inferior coal has been loaded, operators will be required to unload and clean the coal or to deduct 50c. per ton from the Government price. The Fuel Administration is given power to prevent offences of this kind being repeated. On the other hand operators of mines may receive a special allowance for coal mechanically washed or extraordinarily cleaned or picked in such a manner that the fuel value of the coal will be substantially increased by the removal of waste and impurities.—(*American Coal Age, June,* 1918.)

Fuel from the Ashpit.—The French Compagnie de Fives-Lille is now washing the unconsumed coal and coke from its various furnaces, boiler houses, etc. Some 30 to 50 per cent. of the cinder (rarely less than 10 per cent.) can thus be saved for fuel in some cases. The fuel thus saved at the various plants represents about 30 tons per day. The cinder is sorted out on screens into three classes, according to size. Everything below 10 mm. is rejected; the sizes between 10 and 50 mm. are washed in rheolaveurs, and the material above 50 mm. is hand picked. Three men attend to the whole plant of screens, washers, etc. The cost of salvage is about 16*s.* 8*d.* per ton, and the fuel saved is worth about 56*s.* per ton. The residue heaps from coal washeries are also subjected to the same treatment.—(*Iron and Coal Tr. Rev., July* 19, 1918.)

Lignite as a Source of Electric Power.—Previous to the outbreak of war German chemists were experimenting in Devon on the utilisation of lignite for general electrical power. The lignite deposit is in the Bovey Tracey basin, and was at one time worked to supply fuel for the local potteries. In March 1914, Dr. Lambrecht, the leading mineralogical adviser to the German Government, submitted a report to his employers, the Deutsche Bohrgesellschaft, on the property and works, in which he referred in the highest terms to the results and prospects of generating electrical energy at very low cost. This view is now confirmed by an experienced English mineralogist, and though the lignite has the great disadvantage as fuel of being high in sulphur, valuable by-products would be obtained from it.—(*Coll. Guard., July* 5, 1918.)

The Carbonisation and Distillation of Peat.—The carbonisation and distillation of peat, sawdust, household refuse and other light organic products are discussed by Galaine and Houlbert in a paper to the Paris Académie des Sciences. They maintain that the value of peat lies in the direction of distillation rather than combustion. In the process of distillation, peat, being a light material, requires larger retorts than coal, and of a design which facilitates the transmission of heat from the surface to the centre. Experiments have shown that revolving retorts produce the best results. The rotary movement of the retorts ensures rapid transmission of heat from the furnace, and as this heat acts on a very large surface the peat is uniformly carbonised in a short time at a relatively low temperature—a result which, according to the authors, is unobtainable by any other process.—(*Coll. Guard., July* 5, 1918.)

The Coal and Steel Industries of Brazil.—In order to encourage these industries the Brazilian Government has recently instituted a system by which all works above a certain size, in need of financial assistance, can obtain loans from the Government at 5% interest; in the case of coal mines the amount is limited to half the capital, in the iron and steel works to the value of the plant. Works which avail themselves of this offer are subject to a certain amount of Government control, as regards inspection and the approval of projected extensions.

The Federal Government has also promised to establish low freights on the railways, and, in cases of need, to construct railways for the transport of ore and necessary materials. All Government requirements in iron and steel will be supplied from the State-aided works. In the steel industry the great difficulty is the fuel supply, but

it is hoped that the cultivation of eucalyptus trees will solve the problem. It has been proved that these trees yield wood in 5 years, the cost being 9 dollars for 12 cubic metres, a quantity equivalent to a ton of coal. If sufficient iron were produced to meet the whole home demand, 1,800,000 cubic metres of timber would be required per annum, and it is estimated that for this purpose it would be necessary to plant an area of 59,000 acres at a cost of 1,500,000 dollars.—(*U.S. Com. Rep., May* 11, 1918.)

Iron Ores of Brazil.—Brazilian iron ores will play an important part in the reconstructed industries of Europe after the war. The Brazilian ore-field takes rank among the five great iron-ore districts of the world, the others being the Lake Superior district of the United States, the Lorraine ore-fields of Northern France and Western Germany, the Northern Sweden deposits, and the ore-field of Oriente, Cuba. The Brazilian field is the greatest known undeveloped iron-ore district in the world. Its aggregate tonnage has been variously estimated up to three and a-half billions. The largest deposit contains at least five hundred million tons, while deposits containing from ten to fifty million tons are numerous. The district containing these is about 100 miles square in the State of Minas Geraes, its centre being about 250 miles north of Rio de Janeiro, with which city it is connected by the Central of Brazil Railroad. A new railroad from Victoria for the transport of ore is now being constructed. English, Americans, French, and Germans have, since 1910, acquired interest in these deposits, the English and American holdings being the largest. They include practically all the deposits which will be served by the new railroad. It is hoped that the Brazilian output may eventually reach 10,000,000 tons annually, sufficient to supply England's demand and to leave a surplus for the United States and other countries.—(*Met. and Chem. Eng., June* 1, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Fertilisers.

In Committee of Supply on the vote for the Board of Agriculture estimates, the President of the Board, Mr. R. E. Prothero, said that the manufacture of fertilisers was under the direction of the Ministry of Munitions, but the distribution had rested with his Department since March 1917. With reference to sulphate of ammonia, a flat rate of delivery by rail had been arranged so that farmers all over the country got their supplies at the same price. The congestion of sulphate of ammonia was at one time relieved by exportation, but this had to be stopped. The plan chosen of substituting a sliding scale of prices, whereby merchants were encouraged to order early, had met with remarkable success. Every manufacturer is allowed to supply his old customers within a 5*s*. railway radius, but for those at greater distances he has to obtain a special licence from the Board. By this method it is hoped to effect a saving of about 20 million ton-miles on the whole production of 1,100,000 tons of superphosphate, basic slag, and sulphate of ammonia. The consumption of the last-named had risen from 65,000 tons in 1916 to 238,000 tons in 1918 (to May 31 in each case). The production of basic slag had been greatly augmented, and in the coming fertiliser year the increase is expected to be from 300,000 to 350,000 tons. A considerable supply of potash is also coming forward. (July 18.)

Distillation of Cannel Coal.

In reply to Capt. Wright, Mr. Kellaway stated that a good retort for the low temperature distillation of oil from cannel and other cognate substances would be of interest to the Government. But regard must be had to the difficulties of erecting new retorts on any large scale, and to the fact that sufficient retorts are already available to deal satisfactorily with all the cannel that is obtainable. (July 22.)

Iron Ore (Banffshire).

Mr. Watt asked the Minister of Munitions whether he has done anything to exploit the iron ore discovered in the hill of Altargue, in Banffshire; is he aware that analyses show that the percentage of manganese in this ore is as high as any found in any other part of the world; and will he say whether this source of supply of the wants of his Department in war-time is to be ignored?

Mr. Kellaway: This discovery had not previously been brought to my notice. I shall be glad to receive the fullest available particulars, with a view to an investigation by one of the mining engineers of the Ministry. (July 22.)

Salvarsan.

In a written reply to Mr. Snowden, Mr. Wardle gave a list of the maximum prices for salvarsan and neosalvarsan as laid down for supply to Government Departments and to Local Authorities who use the product under the Government scheme. (July 23.)

Oil Products. (By-products.)

Answering a question put by Mr. Wright, Mr. Kellaway stated that the quantity of cannels, jacks, and the like material capable of producing more than 20 gallons of oil per ton at present being brought to the pitheads amounts to about 2,000 tons per day. The quantity of similar material of as high a grade lying on the pitheads is inconsiderable. No estimate can be given of the quantity of less valuable material of the like nature at present being brought to pithead or lying on the pithead. The quantity of shale daily brought to the surface is 8,876 tons. None is lying on the pitheads except what is kept as a working reserve. The Minister of Munitions has no difficulty in dealing with all the material available. (July 24.)

Brunolinum.

A question put by Sir J. D. Rees elicited the following information from Mr. Kellaway. Permission has been given for the export of substantial quantities of products required for the purpose of preventing the spread of disease in rubber plantations, preferential treatment being given to the plantations of the British Empire. "Brunolinum Plantarium" is a proprietary preparation made from certain tar oils. He could not say if it was more efficacious than other brands, but the firm producing it has received the same facilities as those accorded to manufacturers of other brands, who have raised no objections to the use of light oils. The policy of the Ministry in this matter has been controlled by the necessity of conserving tar oils as fuel for the Navy. (July 24.)

The Dye Industry.

In Committee of Supply, on the supplementary vote for £1,000,000 in aid of the British dye-making industry, the President of the Board of Trade, Sir A. Stanley, referred to our dependence on Germany for necessary dyes at the outbreak of war. Since that time very considerable progress has been made, notably by British Dyes, Ltd., Levinsteins, and the

British Alizarine Company. The goal aimed at—to make this country independent of foreign supplies—has not yet been attained, and it is all important that it should be reached before the termination of hostilities. The Government's proposal of financial assistance was designed to effect more rapid progress. For various reasons it is essential that there should be some fusion of interests, particularly of the more important undertakings. In spite of progress, the dye situation, as a whole, is not yet satisfactory, and it is necessary not only to make the best use of existing resources, but also to extend existing plants, and to assist research. The financial assistance foreshadowed will take three forms: loans secured upon the undertakings and at a fair rate of interest (recoverable); contributions towards the cost of extensions (not recoverable); contributions in aid of research.

The further proposals were as outlined in the President's speech in the House on May 15 last (this J., 204 R).

In a subsequent statement, Sir A. Stanley explained that it was not intended to use the grant of £1,000,000 exclusively for British Dyes, Ltd.; and in reply to questions put and criticisms advanced, he said that some of the information in his possession could not safely be disclosed at the present time, and other information could not be given because the expenditure had not yet been incurred. What the Government required in return for the financial assistance was adequate security, and an undertaking that dividends should be limited so long as a loan was outstanding. Generally speaking, any surplus profits would be allocated to the repayment of the loan, but in some cases it might be used for extensions. Further, firms will be put under obligation to manufacture a prescribed range of dyes, such as cannot now be produced on a commercial basis, but the production of which is essential in the national interest. As to the proportion which the £600,000 for extensions would bear to the total cost, he could not give the exact figure, but, on the average, it would not exceed 40 per cent. He did not know of any further grant in contemplation beyond the proposed £2,000,000. Sums for research will not be confined to manufacturing firms, but will also be available for universities and other institutions. The names of the firms in receipt of assistance will, from time to time, be laid before the House.

After some further criticisms the vote was agreed to. (July 25.)

Sewage.

General Croft asked the President of the Board of Trade whether in view of the scientific developments which have recently been achieved in the treatment of sewage for the increase of nitrogenous and phosphoric contents in Manchester, Worcester, St. Albans, and elsewhere, and, of the increasing demand for organic manures, the Government was prepared to appoint a Committee to inquire into the whole question of saving waste sewage for agricultural purposes.

Mr. Hayes Fisher replied that the case is not one in which the appointment of a Committee of Inquiry will be justified at the present time, but the experiments which are being made at the places referred to are being kept under observation. (July 26.)

Oil Production.

In answer to Captain Wright, Mr. Kellaway stated that supplies of raw material for the production of oil are obtained in agreement with the Coal Controller. Difficulties which have arisen are now under negotiation. The retorts at Radford Gas Works are the only ones completed and in operation; they are capable of dealing with all the cannel as yet available. The retorts at eight other gas works are in process of adaptation, and should be completed in time to deal with the additional supplies of cannel, which it is hoped will become available. An expenditure of £97,300 has been sanctioned for the whole scheme, of which £21,000 has been paid.

The Under Secretary of State for the Colonies (Mr. Hewins) in reply to the same member said that the Petroleum Research Department had been abolished because it was found undesirable to have separate departments for oil production and research. The Mineral Oil Production Department took over the work of research. It is not proposed to publish the Petroleum Research Department's Report, which has been considered by a Committee under the chairmanship of Lord Crewe. The Committee's Report has been laid on the table of the House. (July 29.)

LEGAL INTELLIGENCE.

CASES IN THE PRIZE COURT.

Patent Soap Reagent, Maize Oil, and Soya Bean Oil.—The claims of a number of neutral firms in respect of part-cargoes on eight ships seized by the British authorities *en route* for neutral ports, were heard by the President, the Rt. Hon. Sir Samuel Evans, on June 10, 11, and 12. The goods in question consisted of soap stock or reagent (used for separating glycerin and fatty acids from fats and oils), maize oil, and soya bean oil, valued at £90,000. A leading point in the case was whether on the result of the chemical analysis of the goods they could be classed as contraband at the time they were seized.

The Attorney-General (Sir F. E. Smith) claimed that the cargoes were intended, through the consignee, the Malmoe Oil Co., for Sudfelt & Co., of Melle, Hanover, agent for the Twitchell Process Co. of Cincinnati.

Mr. A. Moore, of the Government Laboratory, said the soap reagent seized was sufficient to liberate 500 tons of glycerin.

Sir E. Richards, for the claimants, denied enemy destination, and described the reagent, which Mr. Moore believed to be the Russian "Petrow" paraffin soap stock, as the best on the market. Its action was purely catalytic; the oil was run into a vat, the reagent added together with sulphuric acid, and after boiling for 10-30 hours the fatty acids separated to the top, and the glycerin was drawn off from the bottom.

Mr. C. A. Mitchell, chemist, said that in the Twitchell process compounds of fatty acids were used to accelerate the decomposition of the fat or oil; in the Russian "Kontakt" process the catalyst was probably a sulphonated derivative of a compound derived from coal tar. The latter was not mentioned in the list of contraband articles, nor were certain seeds, like castor oil seed, used for the same purpose.

Examined by Sir E. Richards on the point as to whether maize oil or soya bean oil were lubricating oils, witness said they were semi-drying oils, and as such were not suitable for lubricating; but they might be mixed with lubricating oils as adulterants. It was not impossible to use maize oil as a lubricant, though it had been tried in America and discarded. He could not say if a semi-drying oil could be converted into a non-drying oil by hydrogenating, but suggested that it would be converted into a solid fat. Answering the President, witness expressed the opinion that maize or soya oil would certainly be useful to the Germans for making lubricants.

Dr. J. Fox, of the Government Laboratory, said that practically all the semi-drying oils (except Chinese wood oil) could be used for lubricants, as

they could all be hydrogenised and converted into non-drying oils; but he did not know if use had been made of this fact commercially. He exhibited a specimen of a lubricating oil made from hydrogenised soya bean oil mixed with 14 per cent. of mineral oil, and also a lubricating grease, similarly made but containing mineral oil, which had been in the box of a motor car for nearly a year. Witness also said that he had seen a sample of oil from a German torpedo which was a mixture of a semi-drying oil and an animal oil. Such an oil would not freeze in cold weather. He had made a mixture like it from maize oil and lard oil.

Mr. J. Cuthbertson, a manager of W. Tulloch and Co., of Glasgow, to whom the consignment of soap stock was released by the authorities pending the decision of the Prize Court, stated that his firm had acted as agents for the Twitchell process since 1906. When that patent expired an improved Twitchell reagent was brought out. In 1914 the Russian "Kontakt" process was introduced, for which the Twitchell Co. had obtained the rights. The normal amount of reagent required in the "Kontakt" process was ½—¾ per cent. With this amount a "split" was obtained in about 30 hours, but the time could be halved by doubling the quantity of reagent. The "Kontakt" soap stock was half as strong again as the Twitchell.

After hearing counsel's speeches, the President reserved judgment.

Essential Oil and Drug Seizures.—On July 1, the President had before him a group of cases relating to seizures of consignments of essential oils and drugs on five neutral ships. The particulars were as follows: *Arkansas* (Danish), first occasion, one case of codeine valued at £850, shipped at New York by Merck and Co.; *Skogland* (Norwegian), 536 cases of essential oils (peppermint, anise, and linseed) valued at £12,000, shipped by F. E. Toennies and Co. at New York; *Progreso* (Norwegian), 35 cases of essential oils (peppermint, cedarwood, citronella, linaloe, and spearmint), and five drums of drugs valued at £1500, shipped at New York by F. E. Toennies and Co.; *Arkansas* (second occasion), two drums of peppermint oil valued at £800, shipped at New York by Joseph H. Browne; *Kentucky* (Danish), two cases of wormseed oil valued at £100, shipped by Joseph H. Browne; *Bia* (Swedish), one drum of cananga oil valued at £150, shipped by Société Coloniale Indo-Belge at Batavia to the Nederlandsche Indische Handelsbank of Amsterdam at Gothenburg.

Captain M. H. Anderson, R.N., appearing for the Crown, asked for an order for the sale and detention of the goods under the Reprisals Order in Council. A common feature in all the cases was that Gustaf Clase, who was the consignee in all but one, appeared as claimant in all six cases. The appearances in the two *Arkansas* cases, and in the *Kentucky* and *Bia*, had, however, been withdrawn, and the only remaining claims before the Court were those in the cases of the *Skogland* and *Progreso*, the claimants in each case being F. E. Toennies and Co., and alternatively Gustaf Clase in case the Court should hold that the property in the goods had passed to him. It was claimed that the transactions between F. E. Toennies and Co. and Clase were genuine ones, but the Crown's case was that Clase, a commission and forwarding agent at Gothenburg, was acting as intermediary between Heine and Co., chemical manufacturers, of Leipzig, and Heine and Co., of New York.

Mr. Stuart Bevan, for the claimants, said that although Toennies and Co. had put in a claim, his view was that the property in the goods at the time of seizure was in Clase. Counsel agreed that there were no documents in support of the Crown's case to throw doubt upon Clase's statement, and so far as he was concerned these were genuine transactions.

In answer to the President, Mr. Bevan said that there was a letter from Clase intimating that since the beginning of the war he had had great difficulty in getting his goods out of England. He was anxious to supply orders to Russia, and the action of the Englishmen had prevented him from starting a competing business against the Germans in that country. Previous to the war nine-tenths of this business had been in German hands, and he was convinced that he would be able to beat the Germans if England would not prevent him from obtaining his essential oils.

The President pointed out that the case clearly was one that required the fullest investigation. He was willing to accept Clase's explanation, although there was a good deal of suspicion attaching to the case. The order he made, and which related only to the goods seized on the *Skogland* and the *Progreso*, was as follows: "By consent, no order for detention, net proceeds of sale, after deducting £150 for the costs of the Crown in these proceedings to be paid out to claimants' solicitors on their undertaking to apply the same in the purchase, on behalf of the claimants, of 5 per cent. British War Loan, certificates of which are to be handed to them. Until the conclusion of peace the War Bonds so purchased not to be disposed of, nor interest thereon to be paid to anyone other than a person sanctioned by the Treasury."

As there were no claims to the goods seized on the *Arkansas*, *Kentucky*, and *Bia*, his Lordship made an order for sale and detention of the proceeds in Court until the conclusion of peace.

Borax Seizures.—On July 11, Sir Samuel Evans dealt with valuable consignments of borax and other goods seized in 1915 in course of transit from the United States to Scandinavian ports. The consignors in each case were the Roessler Hasslacher Chemical Co., manufacturing and importing chemists, of New York. The seizures were as follows: Danish steamship *Kentucky*, 2135 sacks of borax; Danish steamship *Florida*, 2113 sacks of borax; Danish steamship *Terje Viken*, 5644 bags of calcined borate; Norwegian steamship *Tanafjord*, 4319 sacks of borax; and Norwegian steamship *Camilla*, 1071 sacks of borax. In the first three instances the consignee was Thorvald Giessing, of Copenhagen; in the case of the *Tanafjord*, Sverre Gubransen, of Christiania; and in the last case, H. Junger, of Christiania. All the goods were claimed by the Roessler Hasslacher Chemical Co., except in the case of the *Terje Viken*, in which there was now no claim, an order for security of costs not having been complied with. The case for the Crown was that the goods were ultimately destined for the enemy, an allegation which the claimants denied.

Sir Erle Richards, for the claimants, said that he was told that all the borax had been sold. That on the *Kentucky* realised £3369, on the *Florida* £3037, and on the *Camilla* £1481. The goods on the *Tanafjord* had been sold, but no account of the sale had yet been received.

Sir S. Evans made an order, by consent, to the effect that the proceeds should be detained until the conclusion of peace, on the understanding that all parties were to be protected from any prejudice relating to the questions either of the destination or the ownership of the goods. In the meanwhile the proceeds were to be invested in 5 per cent. War Loan, all questions between the parties to be decided on the conclusion of peace. As to the goods on the *Terje Viken*, there being no claimant before the Court, his Lordship ordered that the goods be sold, and the proceeds detained until the conclusion of peace, and then to be further dealt with.

REPORTS.

Fifty-fourth Annual Report on Alkali, etc., Works by the Chief Inspector, 1917. *Pp.* 60. *Price* 1s. 6d.

The total number of registered works in the United Kingdom in 1917 was 1582, as compared with 1560 in 1916; this includes 168 works in Scotland. The average escapes of acid gases were generally higher than in the previous year, but in works for the concentration of sulphuric acid conditions were improved in this respect owing to lessened pressure on the plant consequent on increased concentrating power and on a greater output of strong acid from catalytic plant. War conditions continued to affect standards of working, but appreciation is expressed of the large amount of work done in achieving output, in repairing and extending plant, and in introducing new processes, whilst a more widespread recognition of the advantages of scientific control and of co-operative effort is noted.

The use of nitre-cake in place of sulphuric acid for decomposing salt at alkali works was further extended (see Report for 1915; this J., 1916, 1010), so that the production of hydrochloric acid per unit of salt-cake again fell off. In the *cement* industry some preliminary work has been done in this country in attempts to recover the available potash, and the hope is expressed, that where conditions are suitable, practical recovery will be accomplished in the early future, though it is pointed out that the potential quantity of potash concerned is much smaller than in the iron-smelting industry.

Smelting Works. Reference is made to the active development of lodes containing wolfram and to the necessity for research in improving the recovery of tin and wolfram from the ores. It has been estimated that over 35 per cent. of tin and a still higher proportion of wolfram are lost under the present method of working, and it is thought that, if this loss could be reduced by 10 or even 5 per cent., the resuscitation of many properties now closed down would be secured. At works where sulphide ores of zinc are calcined there was a further advance in utilising the gases evolved for the manufacture of sulphuric acid, and electrolytic methods for the extraction of zinc from calcined sulphide ores continued to make progress. Much attention was also given to electrical and other methods for preventing the discharge of dust and fume from smelting works, which led to the recovery of valuable material.

Sulphuric Acid. There was much pressure on plants in the early part of the year, but later the position was distinctly easier; the continued demand for acid of the highest strength led to a further increase in plant designed for contact processes. In operating the chamber process the question of intensive working continued prominent, and examples of the more recent types of plant became more numerous. With a relatively limited chamber space per unit of sulphur burned, however, it is pointed out that close and skilled supervision is of special importance, since the rate at which the gases pass through the reaction space is much increased; for example, in one case (a column chamber set working on the Opl system) it was computed that all chemical interaction had to be effected in 12.3 minutes, as compared with an available 144 minutes in an ordinary chamber set. A new feature was the introduction of catalytic methods for supplying the necessary nitrogen compounds, instead of using nitrate of soda and sulphuric acid, as in the usual "potting" method. The plan of interposing an iron contact tower between burners and Glover tower (this J., 1917, 990) is being adopted in a larger number of works. In reporting on a case of fire at a sulphuric acid works it is noted that the results were aggravated by the presence of nitre in the fire zone, and it is recommended that not only should care be exercised as to the storage of nitre, but also that nitre bags should be washed, since in the dry unwashed condition they are easily ignited and burn with almost explosive violence. At another works the contents of a coke-packed scrubber connected with a cascade concentrating plant took fire. The leaden casing of the scrubber was enclosed in 2-inch boarding. In view of similar outbreaks connected with Kessler and cascade plants, a warning is issued against working such condensers at an unduly high temperature, and some preliminary cooling before the gases reach the scrubber is recommended. A fatality is reported due to arseniuretted hydrogen liberated during the cleaning out of a railway tank waggon used for acid transport. After repeated washing out of the tank with water a workman entered to remove sludge with a new galvanised bucket; conditions favouring the production of the gas in question were thus realised.

Chemical Manure Works. Early in the year a difficulty in obtaining an adequate supply of acid hindered production, whilst later, although stocks of acid accumulated in some works, other obstacles arose to retard operations. The use of nitre-cake in place of acid was tried in different works with varying success. The amount of mineral phosphates imported showed a further decrease.

Sulphate and Muriate of Ammonia and Gas Liquor Works. The change from the manufacture of sulphate of ammonia to production of concentrated liquor continued, and several works ceased entirely the manufacture of sulphate. The number of registered works has again increased, and, owing to the active demand for gas, the quantity of ammonia recovered was distinctly greater than in 1916, in spite of many adverse influences. The methods applied in the analysis of ammoniacal liquors, summarised in the Report for 1909 (this J., 1910, 943), have been critically tested, and revised methods are given for the estimation of thiocyanate, of cyanide in concentrated liquor, and of polysulphide. Further experiments also were carried out with a view to minimising the losses of ammonia in the "direct" process (which has been brought into more extended use). Manufacturing methods for the production of ammonia from hydrogen and nitrogen are reported to be making rapid advances not only on the Continent and in America, but also in this country.

Nitric Acid Works. In several works synthetic methods added to the aggregate output. Effective attention was given to the conversion into nitric acid of the nitrous gases evolved to some extent in the decomposition of nitrate of soda. A fatal case of "gassing" by oxides of nitrogen is recorded. A bricklayer working outside the roof of a nitric acid plant, close to the exit of the recovery towers, became affected, and, although the symptoms were not thought serious at the time, he died 50 hours later from extensive congestion of the lungs. Emphasis is again laid on the special danger of inhaling these gases, the evil consequences of which develop to a maximum only after many hours.

Electrolytic methods for the manufacture of chlorine were increasingly adopted, and there was development in the production of chlorates. In the tinplate industry operations were adversely affected by difficulties respecting supplies of labour and material. Nitre-cake, in place of sulphuric acid, was widely applied to the pickling of the steel plates prior to tinning. Improved methods of picric acid manufacture are reported, and much advance has been made in dealing with the nitrous fumes produced. Lack of sufficient condensing power is again noted in some tar dehydrating plant, with consequent loss of valuable light oils.

Considerable expansion in zinc production is anticipated in the immediate future; electrolytic methods of extraction are receiving much attention.

[Technical details contained in the Report are appearing in the Abstracts.]

DOPING IN AIRCRAFT WORKS.

The Annual Report of the Chief Inspector of Factories and Workshops for 1917 [Cd. 9108, 3*d.*] contains a special report on "Doping in Aircraft Works" by Mr. S. Smith, Dangerous Trades Inspector, of which the following is an abstract :—

During the period in which dopes containing tetrachlorethane were in use 70 cases of toxic jaundice, including 12 deaths, were reported. A standard of ventilation for dope rooms of 30 changes of air per hour was adopted with good results, but in September, 1916, the use of tetrachlorethane was discontinued. The new dopes containing acetone (diethyl ketone), acetone substitutes (impure mixtures of dimethyl ketone, methyl ethyl ketone and higher homologues), and benzol, also the varnishes containing amyl acetate, still gave trouble as regards nauseating smells, and it was found necessary to maintain the same high standard of ventilation as before. Complaints have been received that where the dopes were used intermittently without mechanical ventilation, the effects from the fumes were more noticeable than those from the older poisonous dopes, and this is especially true where large aeroplanes have their fuselage doped in the erecting shops where no system of artificial ventilation can be applied. As far as possible the fuselage components are being doped before assembly, in properly ventilated rooms, as in the case of wings and planes. The use of sprays instead of brushes gives rise to excessive fumes and mists, so that it is still more necessary in such cases to have efficient ventilation.

During 1917 Drs. Panton and Paddock, of the London Hospital, made a special investigation of the blood conditions of dope-room workers, and found that a mild degree of anæmia existed, but to such a small extent as to be of no practical importance except as an indication that a relaxation of the regulations might cause serious illness. In 1917 only 11 cases of dope poisoning were notified, although there were three times as many firms engaged on aeroplane work as in 1916, and the number of hands employed rose to several thousand; further all the notified cases occurred in factories where the ventilation was faulty.

The method of ventilation recommended by the Department, and the one found in practice to be the most efficient, is a low-velocity-scavenge of the air contents of the dope room. Exhaust propeller fans are placed at the air outlets which are situated near floor level at one end of the room. Fresh air inlets are arranged at the other end about 8 to 10 feet above the floor. These inlets are at least three times the area of the exhaust fans, and the incoming air is heated by passing through radiators or stoves. The fans are designed to pass the air contents of the room once every 2 minutes. In this way the heavy vapours are quickly drawn below breathing level without perceptible draughts being caused within the room. The reverse system of using centrifugal pressure fans at the inlet is not to be recommended; it is about five times as costly to instal and work, and not nearly so efficient. One particular case of the system was investigated. The high velocity of the air currents was found to give rise to numerous eddies, cross-currents and stagnant pockets, and the workers complained strongly both of draughts and of the smell of the dopes.

GOVERNMENT ORDERS AND NOTICES.

THE PETROLEUM PRODUCTS (WHOLESALE PRICES) NO. 2 ORDER, 1918.

The Order revokes the Petroleum Products (Wholesale Prices) Order, 1918, and sets forth in the Schedule new prices at which the various products must be sold.

THE SCHEDULE.

Spirit, in cans.	Per gallon. s.	d.
Aviation	3	7½
Special Boiling Points	3	5
No. 1	3	4
No. 2	3	3
No. 3.	3	2

Commercial consumers are charged 1*d.* per gallon less for delivery in steel barrels and 1½*d.* per gallon less in bulk.

Kerosene.	Per gallon. s.	d.
Long-time Burning Oil, in bulk	1	9
No. 1	1	9
No. 2	1	8

For delivery in barrels *ex* wharf 2¼*d.* per gallon more. All the above prices are subject to an additional 1*d.* per gallon for delivery in Scotland or Ireland.

	Per gallon. s.	d.
Raw White Spirit, as imported, ungraded and unrefined, for distribution under licence	2	5

Gas Oil.	Per gallon. s.	d.
In bulk *ex* wharf	1	4

In barrels 2¼*d.* per gallon more.

Fuel Oil	Per ton. £	s.	d.
In bulk *ex* wharf	14	0	0

In barrels 2¼*d.* per gallon more.

[The full text of the Order is given in the *London Gazette* for July 23.]

Maximum Prices of Imported Timber.—In accordance with the terms of the Timber Control Order, 1918, the Controller of Timber Supplies has issued a list of the maximum prices at which imported timber may be sold.

Corrigendum.—With reference to the Formaldehyde (Dealings) Order, 1918 (this J., 285 R), it is notified that the words "£150 per barrel" in line 3 of the first clause should read "£150 per ton."

OTHER ORDERS.

The Cocoa and Sweetmeat Box and Advertisement Order, 1918. Board of Trade, July 19.

The Railway Wagons Census Order, 1918. Board of Trade, July 25.

Imported Softwood. Defence of Realm Regulation. Board of Trade, July 26.

Road Transport (No. 2) Order, 1918. Board of Trade, July 26.

Revocation of Licence to apply on behalf of Persons on the Statutory List for Letters Patent, Trade Marks and Designs. Foreign Office, July 27.

The Pitwood Order, 1918. Board of Trade, July 29.

Order for Securing the Welfare of Workers in Factories and Workshops in respect of the provision of First Aid and Ambulance arrangements. Home Office, July 20.

The Safety Lamps Order of the 30th July, 1918 (Coal Mines Act, 1911). Home Office, August 1.

PROHIBITED IMPORT.

By the Prohibition of Import (No. 26) Proclamation, 1918, dated August 2, the importation into the United Kingdom of red prussiate of potash was prohibited.

PROHIBITED EXPORTS.

The following recommendation from the Board of Trade was approved by the Privy Council on July 30, 1918:—

That the goods mentioned in the Schedule to the Proclamation of the 10th day of May, 1917, as amended and added to by subsequent Orders of Council and marked "(C)," which are at present prohibited to be exported to all destinations in European and Asiatic Russia and in other foreign countries in Europe and on the Mediterranean, except France and French Possessions, Italy and Italian Possessions, Spain and Portugal, and to all ports in any such foreign countries, should be prohibited to be exported to all destinations in European and Asiatic Russia and in other foreign countries in Europe and on the Mediterranean, except France and French Possessions, Italy and Italian Possessions, and Portugal, and to all ports in any such foreign countries.

CALORIFIC POWER OF COAL GAS.—With reference to the Gas Works Order, 1918 (this J., 267 R), the Metropolitan Gas Referees have prescribed, in the cases of the South Metropolitan and the Commercial Gas companies, that if the Gas Examiner finds that the calorific power of the gas be lower than 450 B.Th.U., he shall be at liberty to omit the prescribed testings for the day for illuminating power. In testing places for the Gas Light and Coke Co., the Examiner shall give notice to the Company and make a second testing only when the calorific power is found on the first testing to be below 450 B.Th.U. gross per cub. ft.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, July 25 and August 1.)

OPENINGS FOR BRITISH TRADE.

Firms at East Toronto and Hamilton, Ontario, desire to obtain agencies for U.K. manufacturers of, *inter alia*, chemicals, dyes, gelatine, glue and greases. [Ref. Nos. 200, 201.]

A firm in Melbourne seeks agencies for U.K. manufacturers of chemicals, drugs, essential oils, rubber goods and chemists' sundries. [Ref. No. 160/27.]

A firm at Rio de Janeiro desires to get into touch with British firms importing, *inter alia*, Indian corn, tapioca, starch, castor oil, etc. [Ref. No. 209.]

A firm at Barcelona able to export olive oil, nuts and fruits, desires a selling agent in the U.K. [Ref. No. 212.]

TARIFF. CUSTOMS. EXCISE.

Canada.—A Bill has been introduced into the Canadian House of Commons which proposes the payment of bounties on zinc produced in Canada from zinc ores mined in Canada.

The export of calf skins, kips and hides of cattle, buffalo and horses is prohibited as from June 13 and of leather, except under licence, as from June 15.

New regulations governing the manufacture and importation of preserved fruits, vegetables and milk may be seen by persons interested at the Department of Overseas Trade.

The import of rubber and gutta-percha, crude caoutchouc or India rubber unmanufactured is prohibited, except under licence, as from June 15.

France (New Caledonia).—The export tax on crude ores produced locally is raised to 8 per cent. *ad valorem*, and an export tax on treated ores of 3 per cent. *ad valorem* has been levied as from March 23.

Gold Coast Colony.—The Customs tariff has been revised as from May 27. The particulars are given in the *Bd. of Trade J.* for August 1.

Japan (Corea).—A temporary Customs Investigation Section has been attached to the Finance Department of the Governor-General to investigate questions relating to the Corean Customs system and the Customs tariff.

New Zealand.—With reference to the Order in Council of April 16 prohibiting the export of hides and calf skins, the *New Zealand Gazette* of May 9 now notifies that for the present application to export these goods to British or Allied destinations will be favourably considered.

Sweden.—The *Bd. of Trade J.* for July 25 gives a list of articles the export of which from Sweden is not prohibited. The list includes flint, kieselguhr, bauxite, fluorspar, cryolite, iron ore, calcareous spar, dolomite, marble, gypsum, heavy spar (excluding china clay or kaolin), meerschaum, grindstones, whetstones, polishing stones, millstones, lithographic stones, slates, amber and jet, wood wool and waste, vegetable ivory, coral, wood pulp, etc.

United States of America.—The *Bd. of Trade J.* for July 25 gives further rulings of the War Trade Board with regard to the restriction of imports. Among the articles affected are manufactures of bone and horn, borax, lead, stone and manufactures thereof, glue, kapoc, asphalt, gypsum, caffeine, lime, castor oil beans and oil, casein, copper, monazite sand, hides, skins and leather.

COMPANY NEWS.

BRITISH DYES, LTD.

In a circular letter to shareholders, issued on August 6, it is announced that, after full consideration, the Board is unable to recommend the approval of the proposals of the Board of Trade in respect of the amalgamation of the Company with Messrs. Levinstein, Ltd. (this J., 1918, 253 R). In the opinion of the Board it would not be in the interest of the industries, on whose behalf the Company was formed, that the national supply of dyes should be dependent on a company constituted, directed and managed on the lines proposed. Among the reasons given for the conclusion are:—The result of an amalgamation on the terms proposed would be to establish a practical monopoly of dyes in this country, and to introduce into the amalgamated company a body of shareholders whose interest would be financial. The tendency of such a company would be to direct its policy mainly towards the payment of dividends and maintaining the value of its shares, instead of towards the establishment of a national supply of dyes. Under the proposed scheme, the voting, and hence the control of policy and management, could be effectively secured by the Levinstein interest. Objection is also taken to the proposed writing up of the capital of British Dyes, Ltd., to the extent of £550,000 in respect of goodwill, and to the provisions of the agreement between Levinstein, Ltd., and the Dupont Company as regards exchange of future inventions and secret processes.

The Board has made every effort to bring about a satisfactory arrangement on the lines of the original scheme, but without success. It proposes, therefore, the adoption of an alternative scheme, which obviates the objections outlined above, which ensures each company retaining its individuality, organisation and management, and provides for co-operation through a joint committee with a policy of pooling profits and losses.

The proposed joint committee should be composed of six directors, three of each company, who may appoint a chairman without the right of a casting vote. In the event of difference between the two interests, the decision should rest with the Government Directors of the two companies. The matters which would come within the purview of this committee would include:—Provision of capital, realisation of fixed capital assets; all expenditure of a capital nature, including development and research; organisation and allocation of research; programmes of manufacture; fixing prices; arrangements for joint selling, and arrangements with other companies for manufacturing, buying, selling and supplying; ascertainment and appropriation of profits, including the question of reserves; and any other questions which the two companies would agree to refer to the committee. In the event of the liquidation of either company, the other would have the option of taking over the whole of the assets (including goodwill), and assuming the liabilities at a valuation which would allow of no consideration for goodwill.

BLEACHERS' ASSOCIATION, LTD.

The report for the year ended March 31 last shows a trading profit of £826,730, after charging £251,890 for repairs and maintenance. The trading profit for the previous year was £794,874. The net profits work out to £527,655, and £263,681 was brought forward. Out of the available balance (£791,336) 6 per cent., plus a bonus of 1½ per cent., has been paid on the ordinary shares, £100,000 is allocated to general reserve, £80,000 to depreciation, £30,000 to fire insurance, leaving £349,091 to be carried forward. The issued capital consists of 2,300,096 ordinary £1 shares, 2,472,560 £1 shares, 5½ cumulative preference shares, and there are £2,250,000 4½ per cent. debentures. The general reserve fund now amounts to £950,000

At the annual meeting held on June 28 at Manchester, Sir Alan J. Sykes referred in very emphatic terms to the desirability of the speedy amalgamation between British Dyes, Ltd., and Levinstein, Ltd.

NITRATE COMPANIES.

The following table gives the essential figures concerning the production and profits of fourteen of the leading nitrate companies during 1917, the comparison figures for 1916 being also included:—

The amount of British capital invested in these companies is over £4,500,000. In spite of an average increase of about 1*s.* 6*d.* per quintal in costs, due to the higher average price realised, the average profit per quintal in 1917 was about the same as that in 1916. The average dividend in 1917 was 4 per cent. in excess of that paid in 1916, and in addition large sums have been allocated to reserves, debenture redemption, etc.

The above facts and figures (for which we are indebted to *The South American Journal*) suffice to show that the past year has been a very prosperous one for the nitrate industry as a whole. In spite of this prosperity and of the general satisfactory financial position, there exists no little anxiety concerning the future. The fact that Germany has succeeded in replacing the 700,000 tons of nitrate she formerly imported by material made by synthetic processes has opened the door to doubt, and the circumstance that there are no data available concerning the costs of production of the synthetic fertilisers has only tended to accentuate the uncertainty. When the war is ended it is generally anticipated that the demand for all fertilisers will be enormous, and therefore, if the necessary freight facilities are forthcoming, there should be ample scope for both natural and synthetic products. In the event of competition, the Chilean Government has the power to materially assist its industry by substantially reducing the heavy duty levied on shipments, now over £3 per ton, and hopes are also placed on the elaboration of improved processes of extraction. It may be added that the annual production of the whole field is nearly 3 million tons, of which the British companies produce about 35 per cent.

ERINOID, LTD.

On the occasion of the opening of a new power installation at the company's works at Stroud, Gloucestershire, at the end of June, Mr. A. Binnie (chairman) claimed that Erinoid, Ltd., had vastly improved upon the German process of manufacture. Before the war Germany had an absolute world monopoly of this product (known there as "Galalith"), which is made by treating (imported) casein derived from skimmed milk with formaldehyde, and is used for a large variety of purposes —*e.g.* as an insulator, and as a non-inflammable substitute for ivory, amber, tortoiseshell, coral, bone, ebony, etc. It is employed in electrical work, for aeroplanes, in the manufacture of buttons, pianoforte keys, and as a substitute for certain kinds of celluloid. Large quantities of "Erinoid" are now being made for export to France, America, Italy, and Spain, for warlike and other purposes.

	Production.		Trading profits.		Est. profit per quint.	
	1916. Quintals.	1917. Quintals.	1916. £	1917. £	1916. *d.*	1917. *d.*
Agnas Blancas	773,343	767,000	73,637	65,413	18	11
Alianza	2,590,092	2,993,857	248,553	389,489	23	31
Angela	359,275	427,777	21,690	34,912	14	19
Anglo-Chilean	2,750,390	2,589,650	617,953	435,719	—	—
Fortuna	1,530,943	1,409,668	67,973	11,457	10	1
Lagunas Nitrate	*527,000	*518,000	40,236	60,625	18	28
Lautaro	*2,121,000	*2,287,000	220,942	330,010	24	34
New Paccha	*380,000	*534,000	6,227	14,634	4	6
Salar del Carmen	380,015	616,180	16,691	63,356	10	12
San Lorenzo	*365,000	*349,000	24,188	16,903	16	12
San Patricio	*262,000	*217,000	7,263	§7,180	7	—
Santa Rita	*456,000	*431,000	18,053	9,902	9	5
San Sebastian	401,100	366,929	33,577	10,419	20	7
Tarapaca	*1,019,000	*660,000	61,835	75,470	17	27

* Estimated. § Loss on working.

TRADE NOTES.

BRITISH.

Palm-sugar Production in Madras.—2,500,000 palm-trees in Madras yield annually 35,000 long tons of jaggery (crude sugar). The Indian annual palm-sugar production is about 300,000 tons, Bengal yielding 100,000 tons, worth \$2,400,000. India's total sugar production (cane and palm) is 3,000,000 tons annually. The United Provinces are the great cane-sugar producing area. The average yield of jaggery by Madras for the five years ending 1915-16 was 154,316 tons.—(*U.S. Com. Rep., April* 29, 1918.)

Gypsum in Nottingham District.—Gypsum is found in the Keuper marls in Nottinghamshire, though the most famous mine is at Chellaston in Derbyshire. The principal products of superfine gypsum are mineral white, plaster of Paris, and Keene's cement. The normal price of mineral white is 50*s*. per ton at Hull or Liverpool, and of plaster of Paris 75*s*. a ton. Keene's cement, made from selected gypsum, is used for statuary, modelling, and artificial marble; its pre-war price was £5 10*s*. a ton. In normal times Nottingham gypsum products are exported to Australasia, India, Canada, South Africa, South America, parts of Europe, and the United States.—(*U.S. Com. Rep., May* 8, 1918.)

Australia.—The difficulty of obtaining raw materials in Australia is becoming marked, heavy chemicals being in the worst position. Supplies from Great Britain of soda ash, bicarbonate of soda, and caustic soda have been so difficult to obtain that prices rose to more than double the English price, reaching £40 per ton for soda ash and bicarbonate, and £90 per ton for caustic soda. Profiteering was rife until the Government fixed the price of soda ash at £2 above landed cost, and of bicarbonate at £23 per ton. Caustic soda, however, was left uncontrolled, except in Victoria, although a licence from the Director of Munitions is necessary to purchase. Shipments have been bought in the U.S.A. at a price permitting the sale in Australia at the rate of £50 per ton, but the Australian Government has not yet granted permission to import. For external supplies of heavy metals, Australia has now to depend on the U.S.A., and the supply is uncertain.

The following table shows the origin of some articles of chemical interest imported into the Commonwealth:—

	Total	United Kingdom	Japan	U.S.A.
Total Merchandise	£29,506,318	38·6%	6·9%	21·9%
Chemicals	£786,482	57·3%	4·5%	21·6%
Iron and Steel ...	£645,391	40%	...	56%
Paints & Varnishes	£240,822	55·5%	5·7%	32%
Paper	£1,013,653	15·7%	2%	31%

(*Ch. of Com. J., July*, 1918.)

FOREIGN.

The Argentine Sugar Industry.—The sugar yield of Argentina in 1917, and also in 1916, was about 85,000 tons, *i.e.*, one-third of the normal crop. The local consumption is 220,000 tons; consequently sugar has been imported from the United States and Brazil. Prospects for the coming crop are good.—(*U.S. Com. Rep., May* 18, 1918.)

German Dye Manufacturers.—An association of German manufacturers of finely-ground dyes has been formed in Berlin, and has been joined by nearly all the firms interested. In addition to looking after the economic interests of its members, the new association will act as a central medium for the distribution of raw materials, both now and during the transition period.—(*Z. angew. Chem., July* 2, 1918.)

Graphite in Madagascar.—The graphite production in Madagascar was 35,000 tons in 1917 and 25,480 tons in 1916; whilst 27,000 and 26,209 tons respectively were exported. A considerable slump has occurred on the local market within the past few weeks, and the price has fallen from 750 to 500 francs a ton (Feb., 1918). Local purchases are very few.—(*U.S. Com. Rep., April* 29, 1918.)

Norwegian Graphite.—A large deposit of graphite situated in Skaland, and under the control of the Metallurgisks A/S of Bergen, has been prospected and now proves to be sufficiently extensive to supply the Norwegian market for a number of years. Experiments have shown that any desired quality of product can be made, from the crudest foundry graphite to a material of 97% purity. An electrostatic process of separation is used. A new company under the name of the A/S Skaland Grafitverk is being organised, with a capital of 1,500,000 crowns (about £80,000). It is proposed to erect a plant capable of producing sufficient graphite to meet present home demand, and to make provision for doubling the plant in case of necessity.—(*U.S. Com. Rep., May* 23, 1918.)

Copra and Coconut Oil in Macassar (Netherlands East Indies).—It is estimated that about 1,500,000 piculs of copra (picul = 133⅓ lb. av.) are being held in stock by speculators (many Germans included) in Moluccas and Macassar for shipment after the war. The quantity exported during the last three years was:—1915, 37,254 tons; 1916, 43,772 tons; 1917, 32,944 tons.

Coconut oil has given good profits to the mills on account of a good demand for and shortage of copra in European markets. One of the biggest oil owners in Holland has purchased the oil mills at Macassar and intends to extend it with elaborate machines, so as to supplant the copra trade to Europe after the war. Another mill is to be erected by a big Dutch oil mill company of Java, and it is anticipated that there will be keen competition between these two mills and European mill owners.—(*Bd. of Trade J., July* 18, 1918.)

Chemical Products consumed on the Transvaal Mines during 1917.

Material.	Total: Value. £	Total: Quantities.	Gold Mines: Value. £	Gold Mines: Amount.
Carbide ...	87,959	—	83,209	—
Cement (bags) ...	71,425	—	67;341	—
Chemicals, Assay and Smelting Requisites...	142,370	—	140,965	—
Cyanide ...	415,153	—	415,153	—
Disinfectants ...	28,557	—	25,139	—
Explosives ...	1,416,403	—	1,321,665	—
Lime (White) ...	114,796	474,478 bags	114,264	472,687 bags
Lubricants, Oils ...	113,772	—	94.654	—
Grease and Tallows ...	85,223	—	77,735	—
Mercury ...	47,815	2,700 bottles	47,815	2,700 bottles
Paraffin ...	30,543	38,952 cases	27,739	35,551 cases
Soap ...	19,212	—	10,680	—
Soda (Crude) ...	19.212	10,531,711 lb.	19,102	10,482,633 lb.
Zinc and Zinc Discs ...	310,967	7,377,241 lb.	310,955	7,377,086 lb.

(*S. Afr. Engin., June* 29, 1918.)

REVIEW.

Monograph on the Constitution of Coal. (*Based on a Paper read before the London Section of the Society of Chemical Industry.*) *By* Marie C. Stopes, D.Sc., Ph.D., *and* R. V. Wheeler, D.Sc. *Published for the Department of Scientific and Industrial Research.* (*H.M. Stationery Office*, 1918.)

The authors of this monograph are to be heartily congratulated on having so successfully co-ordinated and brought to a focus the numerous observations and experiments bearing on this supremely interesting question of the "Constitution of Coal." The observations and experimental researches relating to this subject are to be found scattered through a voluminous literature, as a glance at the bibliography appended to this memoir, shows, containing, as it does, references to the names of some 250 authors, whose papers are quoted in the text. The critical sifting and arrangement of these facts, observations and theoretical deductions, is no mean achievement, and we readily concede the authors' claim, "that the facts essentially bearing on the ultimate and actual composition of coal are here made accessible in approximately true perspective," and further that by their own observations and experimental researches they have materially advanced the solution of the problem as to "what the present, actual structure of a bituminous coal most usually is."

Under the heading, "The action of solvents on coal," are passed in review the various attempts made to obtain information on the nature of coal substance, since De Marsilly in 1862 studied the action of alcohol, ether, carbon disulphide, benzene and chloroform at their boiling points, on different types of coals, proving that all these solvents save alcohol had distinct solvent action on "fat" coals, whereas "lean" coals were but little affected by these solvents, of which chloroform proved to be the most effective. Further, De Marsilly recorded the observation that the solvent action of either benzene or chloroform is not appreciably enhanced by digesting under pressure. During recent years other solvents have been pressed into service, some possessed of high extractive qualities, notably pyridine, to which the writer drew attention in 1899; since which date pyridine has been used by a number of investigators, partly as a diagnostic agent in discriminating between different types of coal and the different constituent parts of a coal, and also to institute comparisons in composition between that of the original coal, the extract and the residue left after treatment with the solvent. Amongst other solvents employed by different investigators are to be mentioned phenol, aniline and quinoline, and benzene, which last named liquid enabled Pictet and Ramseyer (1911) to isolate hexahydrofluorene, $C_{13}H_{16}$, from a gas coal, and these same workers with Kaiser in 1916 succeeded in isolating several pure hydrocarbons from a Saare coal.

Summarising these researches the authors point out that three main facts emerge: "(1) Evidence has been obtained of the presence in bituminous coals of small quantities of (presumably but little altered) resins extractable by ether. (2) Free hydrocarbons exist in small quantities in many coals. (3) Whatever be the exact nature of its action, pyridine affords a means of resolving many coals in such a manner as to render subsequent chemical examination less difficult." In connexion with the hydrocarbons which have been extracted from coals, it is well to note, as the authors do, that these are possibly not essential constituents of the coal. This view is supported by the numerous instances of the occurrence of paraffin in coal seams, which appear to have been "formed locally from the original coal by increased temperature, perhaps due to earth movement at some period in the history of the seam." In addition to such instances as are cited, the writer recalls a case of such an exudation of semi-liquid paraffins, something of the consistence of vaseline, which was observed in one of the seams of the Ladysmith Pit at Whitehaven. Facts such as these coupled with the easy alterability of coal by heat justify the precaution, indicated above.

In a brief review it is not possible to deal with the various facts which are discussed in the next three sections, *viz.*, "Destructive Distillation," "Distillation at Different Temperatures," and "Liquid Distillates," but it must suffice to draw attention to the conclusion arrived at by Burgess and Wheeler from the behaviour on distillation of different types of coal, *viz.*, that in coal there are "two types of compounds, differing in their tendency to decompose; the one, the more unstable, yielding the paraffin hydrocarbons and no hydrogen; the other, decomposed with greater difficulty, yielding hydrogen alone (or hydrogen and the oxides of carbon) as its gaseous decomposition product." In support of this view is cited the difference in behaviour on distillation of the two fractions into which coal can be separated by the solvent action of pyridine and chloroform. These fractions are styled "cellulosic" and "resinic," respectively, and the latter, which is soluble both in pyridine and chloroform, yields on distillation mainly the paraffin hydrocarbons; whilst the "cellulosic" fraction, representing that portion of the coal insoluble in pyridine and that portion of the pyridine extract which is insoluble in chloroform, on distillation gives mainly hydrogen and the oxides of carbon. These observations form the basis of a theory of the constitution of a bituminous coal, and for the terms "cellulosic" and "resinic" the authors propose to substitute the terms "alpha," "beta," etc., as being less dogmatic. The "alpha" group of compounds are those insoluble in pyridine, whilst the "beta" group dissolve, but are insoluble in chloroform; both groups "contain compounds the molecules of which possess the furan structure, and yield phenols when destructively distilled. Compounds are also present the molecules of which have aromatic structures, resembling those of the carbon molecule, but it is unlikely that 'free' carbon is present in coal."

The interpretation of the examination of the "gamma" group, *i.e.*, the portion soluble in pyridine and chloroform, shows it to contain compounds "in which alkyl, naphthene and unsaturated hydro-aromatic radicals are attached to larger and more complex groupings. It is doubtful whether aromatic groupings are present. Under the influence of pressure the bulk of the gamma-compounds have become highly polymerised. The oxygenated compounds in the gamma group are chiefly oxides, probably cyclic oxides; esters, lactones, anhydrides, acids and ketones are absent or present only in small quantity. The gamma-group also contains hydrocarbons; saturated hydrocarbons (paraffins) are, however, present in small quantity only."

This tentative working hypothesis leads to the suggestion that further information, than is procured by the distillation of the products separated by the solvents pyridine and chloroform, might be procured by a more extended use of different solvents.

A most important feature of this monograph is the section dealing with the microscopical evidence of the constitution of coal. It consists of an historical survey of the earlier work, commencing with the observations of Witham (1833), who appears to have been the first to obtain and examine sections of coal under the microscope and to detect "a

regular and beautiful structure in the centre of a piece of coal." This survey contains a record of the work done in this sphere of activity, of the conclusions arrived at, and of the theories advanced by the various workers, up to the present time, leading up to a section in which the author's special researches are detailed. It were futile to attempt, even had one the requisite special knowledge, to give a *résumé* of the wealth of facts, observations and conclusions which the expert palæobotanist has been able to arrive at by the exploration of the subject—an exploration, the results of which give special support to the definition of coal adopted by the authors, *viz.*, "Ordinary coal is a compact, stratified mass of 'mummified' plants (which have in part suffered arrested decay to varying degrees of completeness), free from all save a very low percentage of other matter." Veins, partings, etc., are to be regarded as local impurities and not part of the coal itself.

To anyone contemplating research into the nature of coal, we commend special consideration of the passage, in which the authors set forth "one of the most fundamental facts" to be borne in mind. It is as follows:—"While special species of plants may develop special substances, like certain scented ethereal oils, for example, or may accumulate excessive amounts of certain substances, like the unusual amount of aluminium in the Lycopodineæ, for example, yet in all higher plants, however different their species and individual peculiarities, even if they are as wide apart in geological time as the Coal Measures of the Palæozoic and the present day, the great bulk of the plant body is built up by the re-arrangement of certain fundamental tissues which may be compared with the bricks of a building. Just as nearly every house has slates, bricks, wood-work, plaster, etc., in its construction, so nearly every plant has xylem (wood, lignified elements), parenchyma (soft, cellulose-walled cells), phloem (soft-walled, protein-containing cells), mesophyll (chloroplast-containing cells), epidermis, cork, etc., in its construction. Each of these types of tissue, according to the mass of its substance, the shape, quantity, and position of its mass, determines, in conjunction with the others, the outer morphology of the various species. The substances composing each of these tissues have more or less definite and more or less known chemical composition. Hence, for example, the lignin composing the wall of a wood cell from a piece of timber is chemically like the lignin composing the wall of a wood cell from a leaf strand, though the latter be less in *quantity*. Yet the chemical effect of a large number of small wood cells, easily overlooked individually as they are scattered through the opaque mass of a coal formed of leaves, may yet be quite comparable in their result on the composition of the coal to the larger mass of timber-wood, which can be readily detected here and there in a mixed débris."

"This fundamental fact, *viz.*, that all vascular plants share the same chief types of tissue cells, is the explanation of the gross similarity between coals of very different geological ages—for instance, Cretaceous or Tertiary coals, made from comparatively recent Dicotyledonous flora, may be substantially identical in their response to the ordinary chemical tests with coals of the Palæozoic age, though the species of plants forming the two coals are all entirely different."

How, and to what extent, these plant structures are preserved in the coal substance are dealt with in the work under review, and are further illustrated by plates containing reproductions of excellent micro-photographs. The remaining sections of this monograph deal with "Ulmic" substances, containing a very thorough and interesting discussion of these protean bodies, with the "Action of Reagents," "Artificial Coals," and "Theories," followed by an Appendix on the Classification of Coals, and concluding with an extensive Bibliography.

Enough has been said to show something of the thoroughness of this valuable contribution to the literature of coal, and the effective response to the invitation of the Chairman of the London Section of the Society of Chemical Industry. As the combined work of the palæobotanist and the chemist it has a very special interest, and its thorough study will well repay the investigator and the student of this interesting and recondite problem.

There are one or two minor matters, relating to the production, to which attention may be directed, in the hope that in future editions they may be corrected. The printing of the majority of chemical formulæ is throughout indistinct and difficult to decipher; from the table on page 34, giving analyses from Früh's monograph are lacking indications as to what elementary constituents the various percentages refer. Finally in the quotation on top of page 5, the description of the coal should read "Busty seam" (Birtley, County Durham).

P. Phillips Bedson.

PUBLICATIONS RECEIVED.

Oil Analysis. *By* A. H. Gill. *Revised Eighth Edition. Pp.* 209. *(Philadelphia and London: J. B. Lippincott Co.) Price* 10s. 6d.

Coal and its Scientific Uses. *By* W. A. Bone. *Pp.* 491. *(London: Longmans, Green and Co.) Price* 21s.

From War to Work. *By* Samuel Turner. *Pp.* 109. *(London: Nisbet and Co., Ltd.) Price* 1s. 6d.

Treatise on Applied Analytical Chemistry, Vol. II. *By* V. Villavecchia. *Translated by* T. H. Pope. *Pp.* 536, 105 *Illustrations, and* 11 *Plates. (London: J. and A. Churchill,* 1918.) *Price* 25s.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Induchem, Finsquare, London.*]

POTASH PRODUCTION IN GREAT BRITAIN.

In his paper read recently at Bristol, Mr. Kenneth M. Chance clearly shows that the production of potash in Britain has now reached the stage of practical politics. In the light of an actual output of potassium salts obtained by recovery from blast furnace dust and gases, it may be serviceable to discuss the potash situation from its various aspects.

Many of those well versed in the matter contend that only by working the reserves of soluble potash can the German potash monopoly be broken. Under war conditions, however, it is essential to obtain supplies as adequate as possible with the least expenditure of labour, materials, and time.

Of these "opportunist" proposals (as they may be termed), the two most worthy of consideration are extraction by chemical means from potash felspar and recovery from the flue dust and gases of blast furnaces, cement kilns, and coke ovens.

We are told by the geologists that British supplies of potash felspar are abundant but variable in composition. The largest supplies, being located in North-Western Scotland and Western Ireland, cannot be considered to be well situated in relation to fuel-producing areas. At the time of writing, the labour and materials necessary for conducting the extraction processes on the requisite large scale are not available. Moreover, such processes cannot be said to have taken as yet any practicable form. Of processes proposed there is no end, but one and all are saddled with the difficulty that after treating at high cost material of which, roughly speaking, 90 per cent. is bound to remain as a by-product, no process has as yet left over one of commercial utility. That phase of the problem is still unsettled.

Mr. Chance may, therefore, be supported in his contention that the most hopeful source of potash at the present time is that from flue gases and dust of blast furnaces. This may for the moment be accepted; for, although the analysis of gases and dust from cement kilns shows a similar result but with a lower percentage of recoverable potash, the effect of adding potash felspar to the charge has not yet been investigated, at any rate in Britain, on a considerable scale.

Reverting to the question of blast furnace gases and dust, it is unfortunate that, as the work of Berry and McArthur has proved, the potash recoverable from the dust and gases of the Scottish blast furnaces, which are mostly coal-fired, is considerably less than in the case of the English coke-fired furnaces. The production of pig-iron in Scotland may be taken as about one-tenth of the total British output. Only about 1700 tons of potash per annum is recoverable at present from the Scottish furnaces (this J., 1918, 1 T).

The investigations made by Mr. Chance and his colleagues of the North Lincolnshire Iron Co., Ltd., indicate that the potash-content of blast furnace gases may be increased either by raising the temperature of the furnace or by adding common salt to the charge of raw materials. For obvious reasons, the latter procedure was adopted, and as a result the quantity of potash volatilised as chloride was increased nearly sevenfold. The improvement effected in the quality of the blast furnace gases by the recovery treatment is, he claims, sufficient remuneration for the cost of the recovery plant erected. Mr. Chance proposes that central potash factories be set up, each in a blast furnace district, to deal with the recovered products. (Such materials as the weak, greasy solutions containing potash obtained from the washing of wool (suint) could also be dealt with in the same factories.)

With the higher production of potash in English coke-fired furnaces, and with the increased yield resulting from the use of salt, the problem of supplying the total British requirements of potash (which are estimated at 32,000 tons annually) bids fair to be solved.

In estimating the amount of potash which may be obtained from a given quantity of iron ore smelted, there is necessity for caution in inferring that it is largely a question of the amount of potash contained in the ore, which is said to be the chief source of the recoverable potash. Sir Lowthian Bell states that the latter is derived from the fuel, a belief shared by certain managers of blast furnaces, and also by many geologists. The potash-content has frequently been estimated upon spent coal or ash, thus ignoring the question as to how much has been volatilised before the estimation was made. It is an interesting fact that in some blast furnaces the "potash balance sheet" indicates that a considerable quantity of the potash recovered cannot be accounted for in the charge, unless the coke carries nearly double as much as the analysis reveals. If the fuel actually supplies a large quantity of the potash found in the gases and dust (a result not unexpected on geological grounds), an additional argument exists for investigation into potash recovery from coke oven plant, or, indeed, any industry where large quantities of fuel are consumed.

The question of cost remains to be considered. There has been a tendency recently to estimate costs with the view of production of potash at a price slightly below that at which purified German potash salts were sold in this country before the war (£8 to £10 per ton). It must be remembered that this artificial figure was a result of the monopoly, and bore no real relation to the cost of production of the salts. It was estimated that the mining of the salts worked out at about 8s. per ton, and the purification of the chloride rather over £3 per ton.

Judging by the action of the Germans in the past, we may be sure that rather than see the monopoly broken (leaving out of account for the moment the question of the future ownership of Alsace) the German Government is likely to reduce the price of potash to the cost of production or even lower. How will the British Potash Company be able to counter such action? Is our Government prepared, by a system of tariffs or otherwise, to foster the new British industry?

The supply of potash from vegetable and animal sources is unlikely ever to influence the market to any considerable degree. Of the mineral sources, the soluble compounds will necessarily always yield the cheapest, because most easily recoverable, salts. Various methods of recovery from insoluble potash minerals or mixtures have been discussed on the tacit assumption that soluble salts are non-existent in British geological formations. But is this absence an established fact? The argument adduced has been that if such salts occurred in the British Isles they would have been discovered ere this. But would they? Has the elusive potash ever had an opportunity of indicating its presence, when the borings in our salt measures were conducted with the aid of water, and the recovery of so much of our common salt has been in the form of brine? No systematic Government scheme of exploration has been undertaken. From the showings of soluble potash already known in British geological deposits it is certain that the chance of finding soluble potash is at least as great as that of discovering free mineral oil. Yet a scheme has already been

under consideration for the investigation of home supplies of petroleum. In any case, a country so richly endowed with mineral wealth ought to be in no state of uncertainty as to whether or not it possesses supplies of soluble salts of an important commodity like potash.

COAL OIL PRODUCTION IN THE UNITED KINGDOM.

The question of the production of oil from cannel and other coal in the United Kingdom has come to the fore again after more than half-a-century's retirement. The ever growing application of mineral oil of varied grades for fuel purposes, and the prospect that some of the largest producing centres would ere long consume their whole output locally, had directed the attention of fuel experts to the need for early development of possible home sources of supply before the restriction of transport facilities which the war has engendered made the question one of extreme urgency. The official mind, in the early years at least of the war, appears to have put its trust in hostilities being of short duration, and nothing worth the mention was done by the Government departments concerned to supplement the ever decreasing imports by increased home production until the security of military and naval requirements seemed endangered, and scarcely a tithe of industrial requirements could be met. In deference to the representations of more far-seeing public men, the Petroleum Research Department of the Ministry of Munitions, under the directorship of Sir Boverton Redwood, Bart., was commissioned to prepare and render a report on the production of fuel oil from home sources. In due course apparently the Department rendered its report to the Ministry, and in their hands alone it has remained for upwards of a twelvemonth. Questions in Parliament, asking for its production or publication, or for information as to whether effect would not be given to its recommendations, were answered in a way which showed that its contents did not meet with the approval of the Ministry's officials, and that the Ministry did not intend to act on it. A strong body of outside technical opinion rose in protest against this attitude of the Ministry in a matter of which the urgency became more and more pronounced, and finally was voiced by the Institution of Petroleum Technologists which in February last appointed a strong Committee, comprising members of both Houses and both branches of the Service, representatives of oil and colliery interests and a number of independent technical experts, to report on the prospects of the utilisation of cannel coal and the like as a source of motor spirit, fuel oil, etc., in the United Kingdom. This Committee rendered an interim report in July last, and a summary of its contents is given on another page of this issue. Prompted perhaps by the action of the Petroleum Technologists, the Minister of Munitions in March last appointed a Committee, under the Chairmanship of the Marquess of Crewe, to consider the report already rendered by the Petroleum Research Department, and generally to advise on the questions raised in it. This Committee comprised, in addition to the Marquess of Crewe, two Members of Parliament holding Commissions in the Army, and one representative each of the Ministry of Munitions, the Admiralty and the Controller of Coal Mines, and no others.

Of the integrity and zeal of the members of this not unwieldy Committee there can be no question, but few of them would lay claim to much practical acquaintance with the technical questions they had to consider. They have now issued a Report, the contents of which are also summarised in to-day's issue. The substance of it is that, guided by the evidence submitted, they support the Ministry of Munitions in throwing over the report rendered by the Petroleum Research Department. Apart from conflicting evidence as to available supplies of cannel and allied raw material, and as to the expediency of putting down new installations for their utilisation, the gist of the Report of Lord Crewe's Committee is that labour and materials are now too scarce for anything to be done on a considerable scale. This may well be true, but was it equally true when the Petroleum Research Department made its report? Would the oil position of the country have been the better for a prompt acceptance of the recommendations made in that report? Further, can the country now afford to ignore the recommendations of the Committee appointed by the Institution of Petroleum Technologists? Undoubtedly it can if a very early termination of the war is assured, but we should indeed be foolish to act on this assumption. Meantime such vital public services as gas supply are being wholly deprived, by order of the Ministry of Munitions, of the oil on which they depend in most of our large towns for a considerable proportion of their output, and uneasiness is rife as to the conduct of the Ministry of Munitions in suppressing the report of its Petroleum Research Department—at the contents of which technical men can guess only from brief references and quotations in the Report of Lord Crewe's Committee. The Petroleum Research Department may have blundered, but the technical public would like to consider the whole evidence afforded by its report before convicting it of a blunder. The responsible officials of the Ministry of Munitions stand to lose nothing in public esteem by the prompt publication of information and opinions which they demonstrably have good grounds for disregarding, but procrastination and suppression of reports inevitably breed suspicion of the competence and wisdom of those responsible. It would seem as though nothing short of taking the public fully into confidence will now allay the growing mistrust of the way in which the problem of oil supply has been, and is being, handled by the Government.

WATER POWER: WITH SPECIAL REFERENCE TO SCOTLAND.

W. LINTON.

It is now fully realised that if we are to retain our position as one of the foremost industrial nations of the world we shall have to develop and utilise all our available resources to their fullest extent. In the water power of these islands we have undoubtedly an asset which, if developed on the best lines, will form a most useful contribution to the commercial prosperity of the nation, especially in view of the use of electricity in many industries, old and new.

In the chemical industries electricity is now largely used in electric furnace work, both as a heating agent and for electrolysis, one of the most important of these applications being the fixation of atmospheric nitrogen. While certain authorities claim that the production of nitric acid by synthetic chemical processes is cheaper than by the electric process, it appears to the writer that where electric power can be got at $\frac{1}{4}d.$ per unit the electric process should be easily able to compete with these rivals.

In the metallurgical industries the electric furnace is being increasingly used not only in the manufacture of steels but also in smelting iron ore, some of the lower grade ores being capable of treat-

ment only by means of the electric furnace, while there is a large field for the use of electricity in the production of non-ferrous metals and ferro-alloys.

Britain is not so favourably endowed with water power as many other countries, but that is all the more reason why the fullest use should be made of what powers we possess. Probably the neglect of our water powers in the past has been due to our large supplies of coal, and to the fact that water power plants, besides entailing a large capital expenditure compared with other sources of power, are usually situated in districts remote from populous centres. Owing to the high capital cost of water power plants, by far the largest part of the annual cost of the power produced is due to interest charges on capital, and consequently the more continuously and regularly the power can be used the more cheaply it will be produced. A low load factor entails increased size of works and consequently higher costs for interest. Of course, the same applies to ordinary steam plants, but not to such an extent, because if part is not being used at any time there is a saving in fuel, while in the case of the water power plant there is no similar saving. The use of water power is therefore most economical in those industries where the demand for electricity is regular and continuous.

The source of all water power is the rain, which falls with widely varying intensities. Means of regulating the flow from any drainage area are essential therefore to the fullest development of any water power, as there are practically no industries that could adapt themselves to the varying flow of a stream. In a paper on "Water Power in Great Britain," by A Newlands (J. Roy. Soc. Arts, Jan. 25, 1918; this J., 1918, 155 R), the subject of the varying flow of rivers is discussed at some length, and from the figures there quoted* it is seen that the flood discharge of a river may exceed 100 times the ordinary flow. Where there are no means of regulating the flow, the power available is therefore limited to that obtainable from the minimum flow, unless the water power can be developed in conjunction with some other source of power, and there are few rivers in this country large enough to make the summer flow worth developing. This difficulty is also experienced in Switzerland where in winter the flow of the streams falls very low while in summer they are greatly swollen by the melting snows and glaciers. There the steep fall of the valleys precludes the construction of regulating reservoirs, but it is possible to utilise even the minimum flows owing to the high falls obtainable, 2470 feet in one case (*Schweiz. Bauzeitung*, Nov., 1909) This difficulty has been obviated in a very interesting manner at Etupes in the Department of Doubs in Southern France, where a water power varying from 9000 to 2000 horse power is worked in conjunction with a steam power plant situated at a colliery and utilising colliery waste, the power from the water being transmitted 25 miles and that from the colliery 19 miles. When the supply of water falls off, the output of the steam plant is increased to make up the deficiency (*La Nature*, Sept., 1909).

Given the proper conditions, electricity can be produced from water power more cheaply than from almost any other source, the only other sources that can compete with it in this respect being blast furnace gas and coke oven gas. These, however, have the disadvantage that the supply is dependent on the working of another industry.

The horse power obtainable from any given water supply, where there is provision for regulating the water, will depend on the number of hours per day in which the power is used, the smaller the number of working hours each day the greater will be the horse power obtainable, though the cost per unit will be slightly greater owing to larger works being necessary to convey the required quantity of water in the shorter time. The horse powers stated below are all based on the assumption that the power is used continuously over the 24 hours, if the power is used during 12 hours per day the horse powers will be doubled.

The bulk of the water power in Britain is situated in the west and north-west of Scotland in the area north of the latitude of Glasgow and west of the meridian of Nairn. This area is specially suitable for the development of water power as it has a mean annual rainfall varying from 50 to over 100 inches, and many of the drainage areas lie at a considerable elevation and are situated within a short distance of the sea, while there are numerous lochs which can be made into regulating reservoirs.

In estimating the amount of power available at any site where there are means of regulating the flow, the necessary data are, the greatest steady flow that can be obtained, and the greatest fall available in a short enough distance to make the power worth developing. Thus the working fall must be obtained in a short distance though the water may have to be conducted in an open aqueduct a considerable distance to the working fall, because, the longer the pressure conduit the less energy due to the fall will be available for the turbines. Where there are no means of regulating the flow it is necessary to estimate the greatest flow that could be depended on for a selected length of time. The most accurate method of arriving at the quantity of water which will flow from a given drainage area is to measure the water flowing in the stream as it leaves the drainage area. This however involves considerable expense and time, as to obtain a true average about 30 years' observations are necessary. The usual practice of engineers in this country therefore has been to estimate the flow from any area by means of the rainfall and the drainage area. The rainfall is arrived at from statistics for the nearest place where rainfall observations have been made, and should these be for a short period, by co-relating them with the nearest long period observations. Further in estimating the rainfall for any drainage area, the average elevation has to be taken into account, because the rainfall at otherwise similarly situated places increases with the elevation. It has been found from a study of rainfall observations that it is possible to have three dry years in succession and that the average rainfall for these three dry years is usually about 80 per cent. of the mean rainfall for a long period, and it is calculated that with 120 to 150 days' storage it is possible to regulate this 80 per cent. of the mean annual rainfall. As however the whole of the rain falling on any drainage area does not necessarily reach the stream, it is usual to deduct from this an amount according to the nature and situation of the drainage area, varying from 12 to 16 inches. As to this relation between the rainfall and the run-off from any drainage area no close agreement has as yet been arrived at, owing to the scarcity of data, and any persons acquiring powers to utilise a watershed either for domestic or power purposes should be bound to establish rain gauges on the drainage area and arrange for systematic observations of the water flowing from the area being made by means of their works, so that the information may be available for estimating the run-off from other catchments.

In the area above mentioned there are at present only two plants of any size, *viz.*:—those of the British Aluminium Company at Foyers and Kinlochleven. In addition to these there are within this area 29 sites where the works for regulating

* See *Beardmore's Manual of Hydrology*, p. 152, and vol. lxvii *Minutes of Proceedings of Institution of Civil Engineers*, p. 255. Loch Lubnaig District:—Minimum flow, Sept., 1854, equal to 67 cub. ft. per min. per 1000 acres: maximum, Oct., 1854, equal to 7500 cub. ft. per min. per 1000 acres; ratio 1 to 112.

the water and developing the power can be economically constructed. In selecting these sites no site has been taken where less than 1000 continuous horse power could be developed. The power obtainable at these 29 sites ranges from 1000 to over 30,000 horse power and amounts altogether to 200,000 horse power. These powers may be summarised as follows:—

1	over	30,000	horse power
3	,,	20,000	,,
1	,,	10,000	,,
5	,,	7,000	,,
4	,,	4,000	,,
15	,,	1,000	,,

Mr. Newlands estimates the whole water power available in Scotland from 122 sites as 375,000 horse power or 187,500 on the basis adopted in this paper. Mr. Newlands makes clear however that his estimate is based on a uniform annual rainfall of 42 inches, giving 28 inches capable of being utilised, and does not take into account the possibilities of diverting the water from one watershed to another, and that he has adopted this basis as understating the possibilities. The effect of a separate determination of the rainfall and an investigation of the possibilities of diverting water from one catchment to another, in order to take the fullest advantage of all circumstances, is illustrated in the case of the Loch Ericht basin which has probably larger power capabilities than any other site in Britain. The writer has made a careful study of this district and estimates the rainfall that can be utilised here as very much greater than the 28 inches adopted by Mr. Newlands, and that by bringing into this basin the water from certain adjoining areas and diverting the whole water to the west coast it is possible to develop about 34,000 H.P. Mr. Newlands' estimate for this area is about 6000 H.P. on the 24 hours' basis.

For reasons already stated, water powers such as we are dealing with here can be most economically utilised by industries using electric power regularly and in large quantities (such as the electro-chemical industries), so that the best means of utilising the above powers would be to establish works at convenient centres and transmit to these centres the various powers that can be developed within, say, a radius of 20 miles. Among others there are four such centres which may be taken as examples. The most important of these is Fort William, from which Kinlochleven is distant about 9 miles. It is the terminus of the West Highland Railway and is situated near the southern end of the Caledonian Canal on the shore of the upper part of Loch Linnhe, a land-locked deep-water estuary. There is abundance of suitable ground for the erection of factories and houses while there is deep water close inshore. Some 90,000 horse power could be concentrated here, of which more than half is obtainable from the Loch Ericht basin above referred to, and from the area proposed to be dealt with in the Lochaber Water Power Bill (this J., 1918, 179 R), recently promoted by the British Aluminium Company but withdrawn owing to the opposition it met with in the House of Lords; the rest of the power being obtained from the districts to the north of Fort William. The second of the suggested centres is Inverness which may be considered the capital of the Highlands.. It is situated at the head of the Moray Firth at the northern end of the Caledonian Canal and is the centre of the Highland Railway Company's lines. Here at least 35,000 horse power could be concentrated. The other two centres are Poolewe at the head of Loch Ewe in Western Ross-shire, and in the neighbourhood of Lochinver in Sutherlandshire. These, while they have no existing railway communication, are situated at the head of sea inlets which afford ample harbour accommodation. At these centres 25,000 and 15,000 horse power respectively could be concentrated.

As already mentioned, in order to develop the above powers to their fullest extent it would be necessary in some cases to divert the water from one catchment into an adjoining one. In these cases, however, compensation in water could be given as in the case of abstraction of water for domestic purposes. Hitherto Parliament has fixed this in most cases at one-third of the mean available flow. The average summer flow of most of the streams in question, according to the writer, may be put at 20 cub. ft. per minute per 1000 acres, while in a very dry year the summer flow may fall as low as 12 cub. ft. per minute per 1000 acres. These flows expressed in rainfall equivalents are about 3 and 2 inches per annum, so that with one third of the available flow as compensation discharged evenly over the year in addition to the flood water which cannot be controlled, it is evident that a great improvement would be effected on the rivers after compensation. In most of the streams within the area in question the chief interests to be compensated would be sporting, and as this element should not be allowed to stand in the way of industrial development, Parliament might agree to a smaller amount of compensation water than one-third of the mean available flow. Where the water is to be utilised in its own catchment, a monetary compensation might be arranged for the length of stream from which the water would be excluded, the remainder of the stream being improved by the regulation of the flow.

Any question of the power being used for the benefit of the immediate locality would be met by the establishment of the suggested industrial centres, which would be productive of much greater benefit to the whole neighbourhood than if each of the powers were used separately.

The writer has investigated some of the above powers in considerable detail and has made estimates of the cost of the necessary works. After allowing for working expenses, for 6 per cent. interest on capital, and for maintenance and depreciation at the following rates, 1½ per cent. on the hydraulic works, *i.e.*, dams and aqueduct, 3 per cent. on pipe lines, 2 per cent. on buildings, and 7½ per cent. on machinery, the power can be produced at less than one tenth of a penny per unit. Mr. Newlands quotes the statement of Mr. Morrison, Manager of the British Aluminium Company, that his company's works at Kinlochleven produce 150,000,000 units per annum at a cost at the switchboard of one sixteenth of a penny per unit. In the discussion on Mr. Roberts' paper on the Loch Leven Water Power Works (*Minutes of Proceedings of the Institution of Civil Engineers*, vol. clxxxvii.), Mr. Morrison gives some details as to how he arrives at the one sixteenth of a penny per unit. In addition to working charges he allows 5 per cent. on capital, and practically the same percentages for depreciation as the writer. Mr. Morrison also says "The station load factor was extremely high, approaching unity." On the continuous 24 hours' basis 150,000,000 units per annum is equal to 23,000 horse power. In preparing the original estimates for this scheme with which the writer assisted, the power obtainable from this area was put at 17,000 continuous horse power, equivalent to 111,000,000 units per annum, and 150 days' storage of the necessary water was to be provided. It appears that there is only 100 days' storage of the water necessary to maintain the 150,000,000 units regularly, and it is doubtful whether, with a succession of dry years this storage would prove sufficient. Taking the safe estimate of 111,000,000 units for these works, Mr. Morrison's figure of one sixteenth of a penny would be increased to one twelfth

of a penny. These figures, in any case, show how economically power can be produced from water, given the proper conditions.

Outside the above area there is one power which would be worth investigating *viz.* :—the River Clyde at Lanark. Here the construction of a regulating reservoir would be too costly, but the site is adjacent to the Lanarkshire colliery district and is within 20 miles of Glasgow. The water power could be easily developed in conjunction with a steam plant. The power obtainable from the water here would vary from about 1500 horse power in a dry summer to about 20,000 in winter.

Both in the above area and outside it there are a number of other sites which, on closer investigation, may prove capable of yielding considerable power, while there are also many smaller powers which could be usefully developed. Many factories are at present situated on rivers the power of which could be used to supplement their steam plant by installing a number of water power units which could be used as the water was available. An important example of this, is the use of the water power of the River Don at Stoneywood Paper Works near Aberdeen where Messrs. Alexander Pirie and Sons had at one time three turbines installed capable of producing 1100 H.P. These turbines were so arranged that the number in use could be regulated according to the quantity of water available in the river, the balance being made up by the use of additional steam power. Messrs. Pirie however were prevented from making the fullest use of this power by the decision of the Courts in an action raised against them by certain proprietors of the fishings in the Don, which prevented them from concentrating the water at the upper of their two intakes from the river.

The development of the larger water powers is in many respects a national question, but as they can be most economically employed by certain industries, the best way to ensure that the greatest advantage will be secured from them, would be for manufacturing companies or combinations of companies to undertake their development with State assistance, such as is proposed for the establishment of key industries by Lord Balfour of Burleigh's Committee on Commercial and Industrial Policy, thus giving the necessary amount of State control over what is in a large measure a national asset. If the fullest advantage of this asset is to be obtained for the nation the Government should not stand in the way of private enterprise, but assist in having all preliminary arrangements for its development made forthwith, so that the power may be available at the start of any new industries that may be promoted after the war.

The Lochaber Water Power Bill already referred to was an enterprise such as is suggested. There was however a very considerable amount of opposition to the scheme, due to the proposed diversion of the water from the valley of the Spean without giving any compensation water, and to the use of the power at Kinlochleven instead of at Fort William, while had the British Aluminium Company succeeded, it would have been in a position to prevent others from profitably developing the water from the Loch Ericht basin. The Committee of the House of Lords seemed to think that unless the British Aluminium Company could show that its scheme would materially assist in the progress of the war, it was not expedient under the present circumstances to inquire into the merits of the various objections to the scheme. The writer feels that the British Aluminium Company is to be commended for its enterprise, but he is of opinion that it would have had more chance of success if it had proposed a scheme as comprehensive as that suggested in this paper for Fort William.

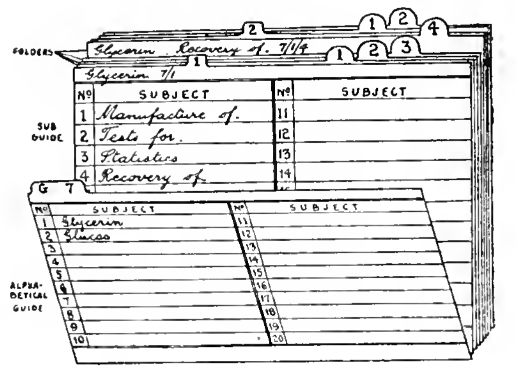
A SYSTEM OF FILING PAPERS, ETC., BY SUBJECT.

M. DE WHALLEY.

It is a very common practice among chemists, engineers, and others who pursue a scientific calling, to collect notes and cuttings referring to matters of importance to them in their profession. In the majority of cases such papers are filed away alphabetically in one of the many kinds of stiff-back binders, notes on such diverse subjects as, *e.g.*, coal, centrifugals and chalk being placed cheek by jowl under the index " C," with every hope of finding a particular one when required. Such a method may answer the purpose for a time, but experience shows that it is inelastic and lacking in finality.

A simple and yet effective means of filing papers by subject with facility for the sub-division of any subject as and when required, without disturbing the general arrangement, is very much desired. This can only be effected by the use of " folders " or " dossiers " arranged behind alphabetical and sub-guide cards in a box or cabinet generally known as a Vertical Filing Cabinet. The time involved in starting and maintaining this system is infinitesimal. The smallest outfit will give facility for increasing the number of subjects a thousandfold, and yet papers on any phase of a subject can be found just as readily in a few seconds.

A set of 26 cardboard guides is required bearing on the tabs the letters of the alphabet and a division number from 1 to 26. The various main subjects, *e.g.*, acids, glucose, etc., as they arise are recorded on the correct alphabetical guide cards and a numbered " sub-guide card " to correspond is started for each subject. These sub-guide cards are printed exactly the same as the alphabetical guides, but the tabs bear a number only, corresponding to



the number printed against each main subject on the alphabetical guide. In starting a sub-guide, the name of the subject and the division and sub-guide number are recorded at the top of the sub-guides thus :—Glycerin 7/1, 7 being the number of the alphabetical guide, and 1 being the tab number of the sub-guide.

Thus we have the main subjects recorded on the alphabetical guides, and behind each guide a series of sub-guides, one for each subject.

The various sub-divisions or phases of any subject as they arise can now be recorded on its particular sub-guide against the numbers printed at the side; and a tabbed folder, numbered to correspond, is started for each sub-division of a subject. In starting a folder, the name of the subject, the division number of the alphabetical guide, the sub-guide number, and the tab number of the folder are all recorded at the top. Thus Glycerin—Manufacture of—7/1/1. Other sub-

divisions of Glycerin would be noted on the folders thus:—

Glycerin—Tests for 7/1/2
Glycerin—Statistics 7/1/3
Glycerin—Recovery of 7/1/4

Thus we have behind each alphabetical guide a series of numbered sub-guides, and behind each sub-guide a series of numbered folders.

The object of having the guides, sub-guides and folders numbered will be observed in the replacing of them; thus the operations in replacing a folder numbered 16/2/5 are to pull forward main guide No. 16 and sub-guide No. 2 behind it, and folder No. 4 behind that, and the folder can be placed in the space so made.

Although this detailed explanation, so essential to render the system of real service, may give the impression that the system is complicated, the diagram will serve to show the extreme simplicity of the system.

Reports, notes, cuttings, etc., are filed away loosely in these folders, but it is always advisable to paste cuttings on to a sheet of paper before filing. Folders can be obtained with a simple arrangement for attaching the papers, if desired.

In all cases of filing papers by subject a means of cross-indexing is useful, if not essential, for a paper can be filed away in but one place. Thus, an article on "Fertilisers" may introduce the subject of "Humic Acid," and whilst the cutting might be filed away under the heading of "Fertilisers," it could with advantage be cross-indexed, or noted under "H" for "Humic Acid" and perhaps also under "A" for "Acids." This can be effected by having a cross-index card behind each of the 26 alphabetical guides, numbered from 1 to 26, one for each letter of the alphabet. These cross-index cards would be ruled in three or four double columns, headed "Subject" and "Filed Under." Thus to cross reference "Humic Acid" to "Fertilisers" an entry would be made on the cross-index card behind H 8 guide as follows:—Humic Acid 6/2/1, or whatever the file number is for Fertilisers.

It is possible to carry the sub-divisions one degree further by recording on the tab of a main guide the name of a general subject instead of a letter of the alphabet. Thus behind the alphabetical guide "A," and its series of sub-guides and folders, another guide marked "Acids" on the tab could be used. On this guide would be recorded "Hydrochloric," "Nitric," "Phosphoric," etc., each of which would have a sub-guide which would in each case enable sub-divisions to be made for "Manufacture of," "Analysis of," etc., etc.

The foregoing illustrates a system for filing to an advanced degree, compact in itself, with facility for cross-indexing, whereby no separate card index is required.

PROGRESS IN PHARMACEUTICAL PRODUCTS.

At the British Scientific Products Exhibition on August 15, a lecture on the above subject was given by Mr. R. R. Bennett, Pharmaceutical Chemist, of The British Drug Houses, Ltd., in which he reviewed the ways in which the war has affected the maintenance of supplies of medicines and pharmaceutical products.

Although the total number of vegetable drugs which have been unobtainable owing to the cessation of supplies from enemy countries is remarkably small, certain of them have been in exceedingly short supply. Provision has now been made for the supply of these by a vigorous cultivation of those necessary plants which can be grown at home, and by utilising more fully the resources of the colonies.

The lecturer exhibited fine specimens of belladonna root, belladonna leaves, hyoscyamus leaves, stramonium leaves, digitalis leaves, aconite root, colchicum corm, colchicum seeds, valerian root, chamomile flowers, and other drug-yielding plants now being successfully grown in this country.

With reference to the group of elementary chemical products, it was noted that in respect of bromine, iodine, bismuth and mercury, four elements of prime importance in medicine, Government intervention has safeguarded the receipt of adequate supplies from neutral countries. Many fine chemicals, such as quinine, morphine, strychnine, ether, and chloroform, have always been British products, and a considerable export business has been done in some of them. On the other hand, the production of such alkaloids as atropine, hyoscine, emetine, eserine, and many synthetic organic chemicals has needed stimulation.

In 1914 the production of salicylates was practically a German monopoly, but this manufacture has now become an established British industry. Salicylic acid, and its derivatives, sodium salicylate, salol, and acetylsalicylic acid are all produced here on a commercial scale sufficiently large for present and estimated future requirements. Saccharin which was formerly imported is now a British product.

So far during the war whenever a particular substance has been required for a particular purpose, whether for medicinal, technical or warlike uses, British chemical science plus British chemical industry has not failed to produce it in requisite amount and of requisite purity within a reasonable time. The production of synthetic organic compounds has been no exception to this rule. For the treatment of venereal diseases kharsivan and neo-kharsivan, arsenobillon and neo-arsenobillon have replaced salvarsan and neo-salvarsan. Furthermore, di-ortho-amino-thio-benzene or intramine has been manufactured and used in conjunction with colloidal iodine and colloidal mercury with very marked success in the treatment of syphilis. In the treatment of *ulcus molle*, British bismuth subgallate and British bismuth tribromphenol replace the German proprietaries "Dermatol" and "Xeroform."

Several British firms have undertaken the manufacture of analytical reagents conforming to the specifications of purity published by the special committee appointed by the Councils of the Institute of Chemistry and the Society of Public Analysts. Specimens of these were shown, as was also a series of dyes which are used in the laboratory as microscopic reagents. Fluorescein, fluorescein sodium, eosin, erythrosin, eosin methylene blue, azur II., azur II. eosin, methylene azur, methylene violet, and polychrome methylene blue, of British manufacture, and guaranteed to be free from diluents of any kind, can now be obtained. These materials are from two to four times the strength of the dyes formerly supplied as microscopic reagents by certain well-known German manufacturers, since these contained a high percentage of inorganic or organic diluent, usually sodium chloride, sodium sulphate, or dextrin.

Owing to the necessity of meeting war demands, manufacturers have had little time to consider post-war problems, and their work has been performed under conditions entirely unfavourable for creating new industries. If the fine chemical industry is to be developed on a scale in any way commensurate with its importance, Government assistance at the conclusion of hostilities will for a time be essential.

NEWS AND NOTES.

AUSTRALIA.

Science and Industry.—At a conference of the general council of the Commonwealth Bureau of Commerce and Industry, held on August 8 at Melbourne, Dr. Gellatly, Director of Science and Industry, referred to the work which had been done during the past two years. He stated, *inter alia*, that the maturing period for yeast had been reduced to 5½ hours, probably solving the day-baking problem. Mangrove bark had proved a suitable substitute for wattle bark, meaning a reduction of 40 per cent. in the cost of tanning. The committee investigating alcohol fuel for engines had discovered a new denaturant to replace the one used, which was now almost unobtainable. Another committee had drawn up plans for a mechanical cotton picker.

"Blackboy" Wood.—Throughout Western Australia there are extensive tracts of land covered with trees known locally as "blackboys" because the trunks are perfectly black and on the top there is a grass-like growth not unlike the headdress of certain savages. The wood is used to some extent for kindling fires as it burns like waste soaked in kerosene. Chemical investigation has shown that resin, light oil, and a variety of other products may be extracted from it, and all that is needed is a cheap process of treatment.

* * *

Molybdenite.—An expert examination of the molybdenite-bearing ore found at Maldon, Victoria, gave a width of 42—52 ft. at the 400 ft. and 500 ft. levels. The average of the assayed samples was 35 per cent. The estimated cost of mining and treatment is 18*s*. per ton (maximum), and the weekly output should be about 200 tons.—(*Austral. Ind. and Min. Stand., May* 23, 1918.)

CANADA.

British Columbia.

Metals.—The Canada Copper Corporation is to erect a mill at Copper Mountain, B.C., with a daily capacity of 2000 tons.

A branch of the Canada Metal Co., of Toronto, has been opened in Vancouver. Type and anti-friction alloys are being manufactured.

The Aetna Iron and Steel Co., Ltd., is operating a six-ton electric steel furnace in connexion with the rolling mills at Port Moody.

The Government of B.C. has retained Dr. A. Stansfield, of Montreal, to investigate the possibility of applying electrical smelting to the extensive magnetite deposits of the province. An Act has been passed granting a bounty not to exceed $3.00 per ton on pig iron produced from B.C. ore, and $1.50 per ton on iron from ore outside the province. The bounty will terminate after 1923.

A Vancouver syndicate has planned to develop the platinum and chromite deposits of the Tulameen River. Mr. E. Poitevin, Dominion Mineralogist, is investigating the platinum resources of the province, and the Dominion Assay Laboratory is being extended to undertake the assay of platinum. A branch office of the Canadian Geological Survey has recently been established in Vancouver.

Timber and Pulp Industry.—Kraft wrapping paper is now being manufactured at Ocean Falls, and also at Port Mellon, B.C.

Messrs. White Brothers of Michigan, U.S.A., are completing plans for the erection of a pulp plant at Beaver Cove, near Alert Bay. The initial daily output will be 40 tons, to be increased to 200 tons.

The Department of Forestry of the Dominion Government is establishing a Forest Products Laboratory in connexion with the University of British Columbia. The staff will co-operate with the Inspections Branch of the Aeronautical Department of the Imperial Munitions Board in determining the strengths of Sitka spruce for aeroplane construction. An exhaustive examination of Engelman or White spruce, which grows very extensively in the interior, will be one of the first problems. Eventually the work will be extended to organising a system among the lumber mills of branding and grading products, especially for the export trade

Miscellaneous.—Concrete barges of 250 tons capacity are to be built in Vancouver by a Seattle company.

Magnesium sulphate from the saline water of Spotted Lake, B.C., is being exported to the United States.

A Vancouver company with local capital intends to start the manufacture of oleo-margarine during September.

The Burnaby Oil Wells, Limited, has been incorporated with $65,000 capitalisation to explore for oil in promising areas near Vancouver.

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Coal from the United States.—Arrangements have been made by the Fuel and Railway Administration at Washington for the shipment of 28,000,000 tons of coal to the North-Western States and portions of Canada *via* the Great Lakes. Approximately 4,000,000 tons of this will go to Canada, and will materially improve the fuel situation.

High-speed Steel.—The secret process for manufacturing "high-speed" steel which the United States has acquired by commandeering the German Backer Steel Company will be very useful to the Allies. Over 100 tons of Quebec molybdenite, which is also used in the production of high-speed steel tools, has recently been delivered in London at the rate of £1,000 per ton.

* * *

Synthetic Nitrate.—The Canadian Government has been instrumental in having investigated processes for the fixation of atmospheric nitrogen, but no arrangements have yet been made for the actual production.

Nitre Cake.—Many of the Canadian paper mills are now using nitre cake, and, it is reported, with most satisfactory results.—(*Can. Chem. J., July*, 1918.)

Wood Distillation.—A speaker at the recent Convention of Canadian Chemists at Ottawa, stated that Canada's present total carbonising capacity is over 500 cords, or 1000 tons of hardwood per 24 hours, and that from this raw material there is an annual production of 75,000 tons of charcoal, 13,000 tons of acetate of lime, and 1,250,000 gallons of methyl alcohol. Among other derivatives are acetone oils, formaldehyde, acetic anhydride, methyl acetate and sodium acetate, the last three being new products in Canada since the beginning of the war.—(*Can. Chem. J., June*, 1918.)

Natural Gas and Oil in South-Western Ontario. Great activity has been shown in gas and oil development owing to the pressing demands and to the recent very important discoveries in the Trenton geological formation through wells drilled a little below 3000 ft. At West Dover, Kent county, two valuable wells have been located, one of which produces about 3 million cub. ft. of gas under rock pressure and 400 barrels of oil per day. It is confidently asserted that this district will produce increasingly large quantities of high-grade oil and pure quality gas from now onwards.—(*Toronto Globe. Bd. of Trade J., Aug.* 8, 1918.)

SOUTH AFRICA.

Chemical Industries in Natal.—Speaking at a meeting of the Natal Manufacturers' Association on May 22, the Chairman said that marked progress had been made in the local chemical industries. Pure acids were now being produced, and also Glauber's salt, Epsom salt, magnesium chloride, aluminium sulphate, flexible collodion and oiled silks for surgical purposes. Oxygen was now prepared in large quantities for oxy-acetylene welding; and all the above materials were being sold below present landed costs, and many of them below pre-war landed costs. A new gun-cotton explosive had been evolved which was effecting economy in the consumption of glycerin for making mining explosives. The distillation of alcohol from molasses had greatly extended and considerable quantities were shipped to the Home Government. Ether was being manufactured chiefly for use as a constituent of motor fuel.—(*S. Afr. J. Ind., June*, 1918.)

UNITED STATES.

Supply of Organic Reagents in the U.S.A.—Following the publication of articles by Dr. Roger Adams and a recent letter by Prof. Gortner in the columns of *Science*, Dr. E. K. Mees informs us that the Eastman Kodak Co. has decided to make provision for the supply of organic reagents for research and industrial purposes. To this end a separate section of the company's laboratory, the "Department of Synthetic Chemistry," has been established under the direction of Dr. H. T. Clarke.

Gas Warfare.—On July 1 last all the activities of the Government in connexion with the manufacture of poison gas and experimenting in the devising of new methods were transferred to the control of the War Department. The most extensive work has been conducted by the Bureau of Mines, which established a special chemical laboratory at the American University on the outskirts of Washington. About 1700 chemists have assisted the Government by their advice, experience and services.—(*Science, July* 5, 1918.)

Radium from Carnotite Ores.—The United States Department of the Interior announces that the Bureau of Mines has now more than 180,000 dollars' worth of radium for use in the sciences, which was procured for an expenditure of less than 38,000 dollars. The Bureau has turned over to the National Radium Institute about 6½ grams of radium, and has given to the country a method for producing pure radium compound from the ore for one-third the current price of radium. When the Bureau of Mines began this work in 1912, it found that carnotite ore was being sent to Europe, mainly to Germany, and that the radium extracted was sold back to the United States at fabulous prices.

JAPAN.

The Electro-Chemical Industry.—The great progress made of late in the electro-chemical industries has been accelerated by the successive discoveries of new water powers.

Nitrogen Compounds.—Calcium cyanamide is manufactured by two big firms, the Nippon Nitrogen Fertiliser Co. and the Electro-chemical Industry Co. The production of ammonium sulphate was 57,000 tons last year; this year it is expected to reach 90,000 tons. Nitric acid is to be manufactured from atmospheric nitrogen by the arc process. The Government has recently established a central research station for the nitrogen industries, of which Dr. F. Kodera has been appointed chief expert.

Potassium Chlorate.—Before the war Japan imported annually about 3400 tons of potassium chlorate and consumed more than 4500 tons, valued at 1,400,000 yen. About one-third of the pre-war home supply was produced by the Nippon Chemical Industry Co., which has lately greatly extended its activities, no fewer than thirty smaller works having been established. An export trade has grown up.

Phosphorus.—Some 8000 cases (100 lb.) were formerly imported from France, England, and Germany. To-day the Nippon Electric Furnace Industry Co. and the Fuji Electro-chemical Co. are marketing an excellent product.

Calcium Carbide.—The development of the cyanamide industry has naturally favoured the progress of that of carbide, of which material some 80,000 tons is now being manufactured annually.

Electrolytic Alkali.—The total annual production of caustic soda before the war was 9½ million pounds, entirely manufactured by the old process. In addition to the Hodogaya Alkali Works, which has already succeeded in producing a high-grade product by the electrolytic process, the Kwanto Sanso Co. and several others in the Kuisiu district are erecting plants for the same purpose.

GENERAL.

Oxidation of Ammonia.—At the British Scientific Products Exhibition at King's College, W.C., which was formally opened on August 14 by Lord Sydenham, the Munitions Inventions Department of the Ministry of Munitions exhibits a unit plant for the oxidation of ammonia to oxides of nitrogen. Such plant was not in extended use outside Germany before the outbreak of war, but there is reason to believe that the Germans have relied on it very largely for their output of nitric acid for explosives, as well as in the manufacture of sulphuric acid by the chamber process. The method is now in use in this country, and several large firms, such as Brunner, Mond and Co., Ltd., and the United Alkali Co., Ltd., are using apparatus similar to that shown. The apparatus is on view continually during the period of the Exhibition. Demonstrations will be given by an officer of the Munitions Inventions Department on Wednesdays at 4.30 p.m.

Water-power in the British Empire.—The Preliminary Report of the Water-power Committee of the Conjoint Board of Scientific Societies recently issued contains both interesting and valuable information. The Committee finds that at present the world's demand for power amounts to about 120 million horse-power, of which 75 is required for factories, 21 for railways and 24 for shipping. Of the 75 required for factories the United Kingdom accounts for 13 and the British Dominions for 6 more. The development of water-power in the United Kingdom is in a very backward state, only 8·3 per cent. of the estimated total available being utilised. This compares very unfavourably with Germany, where 43·8 per cent. of the total is in use. In view of the necessity for cheap power to permit the recuperation of the Empire after the war it is of the highest importance that the possibilities of water-power within the Empire should be investigated, and this is especially so as it is the only source of energy that is not liable to become exhausted sooner or later. Great advances have been made in recent years in producing, distributing and utilising electric energy from water-power, and among the many outlets for cheap energy the requirements of agriculture for artificial fertilisers will absorb a large proportion of any power that may be developed. The Committee finds that the potential water-power of the Empire amounts in the aggregate to between 50 and 70 million horse-power, and that much is capable of immediate economic development. With the exception of Canada, New Zealand and part of Australia

very little has been done to ascertain the possibilities of the water-power of the Empire. The Committee suggests in the first place the formation of an Imperial Department to initiate and supervise the investigation of the Empire's water-power resources. These investigations should as far as possible be carried out by the different Governments. The Committee further recommends that steps be taken to safeguard the Empire's rights so that while no unnecessary obstacles are put in the way of private enterprise, the ownership of the water-power can never be lost to the nation.

Imperial Mineral Resources Bureau. — The Government has instructed the Ministry of Reconstruction, in consultation with the Secretaries for the Colonies and India, to take the necessary action to give effect to the recommendations of the Imperial Conference and to the findings of the special committee appointed last year to examine and to report upon the proposal of setting up an Imperial Mineral Resources Bureau. The general scheme of the Bureau as defined by this committee has now been ratified by the Imperial Conference, and a governing body appointed under the presidency of the Lord President of the Council. This body will have as its chairman Sir Richard Redmayne; it will include nominees of the Indian and Colonial Governments and a number of experts in metallurgy and mining nominated by the Minister of Reconstruction. Among the last-mentioned are Prof. H. C. H. Carpenter, Dr. F. H. Hatch, Sir Lionel Phillips, Mr. E. Taylor, and Mr. W. Thorneycroft. The secretary is Mr. A. D. McNair, to whom all communications should be addressed at the Imperial Mineral Resources Bureau, Holborn Viaduct Hotel, E.C.

Coal Conservation in the Midlands.—The special committee appointed by the Nottingham Corporation to deal with the fuel resources of the district has arrived at the conclusion that Nottinghamshire has all the essential factors required for it to become one of the Government power centres under the proposed national scheme, including an ample supply of water for condensing purposes, proximity of collieries, railway communication between collieries and suitable sites adjoining the River Trent, and large industries requiring electric power. Fuel, though of a kind unsaleable in normal times, is available in enormous quantities, this including top hard slack, of which a large proportion is left in the mines. This fuel, it is estimated, is available to the extent of from 700,000 to 1,000,000 tons annually, equal to about 10 per cent. of the output, and consumed in a suitable producer it might yield 100,000 cub. ft. of gas per ton, of a calorific value of 135 B.Th.U. There is also the inferior coal known as "jacks," a bastard cannel, suitable for producer fuel, which on the average will yield about 70,000 cub. ft. of gas per ton. Finally the amount of surplus power gas from local coke-oven plants is estimated at 7,500,000 cub. ft. of gas per day, apart from that obtainable from the blast furnaces.—(*Coll. Guard., July* 19, 1918.)

"Helvetica Chimica Acta."—This is the title of a new Swiss periodical in which the original investigations in pure chemistry of Swiss chemists are to be chronicled. The journal is the official organ of the Swiss Chemical Society, and is to be published six or eight times yearly during the continuance of the war. In normal times some 380 papers are published annually by Swiss chemists, hence there should be no lack of material. As an illustration of the co-operation between pure and applied chemistry, it is worthy of note that the necessary capital has been guaranteed by some twenty Swiss chemical firms. The editorship has been entrusted to a committee consisting of Messrs. E. Bosshard and A. Werner of Zürich, F. Fichter and H. Rupe of Basle, and A. Guye and A. Pittet of Geneva. The publishers are Messrs. Georg and Co., of Basle and Geneva.

The Dietetic Value of Skimmed Milk.—The necessity of utilising for dietetic purposes the casein of skimmed milk is the subject of a recent article in *La Nature* (July 13). The feeding of pigs with skimmed milk—which brings them on very rapidly and produces a white pork much sought after—is held to be unjustifiable at the present time, as is also its utilisation for making "galalith" and glue. The process of curdling such milk and of separating the curds to make fresh cheese is extremely simple, and the nutritive value of the product far outweighs the cost. The writer calculates that the amount of casein from this source which would be available for human consumption is not less than 35,000—40,000 metric tons per annum. The assumptions underlying this estimate are: that a cow produces annually 1000 litres of milk, that one-fifth of the milk produced is used for making butter, that the skimmed milk contains 35—40 gms. of casein per litre, and that there are about 5 million cows left in France, out of a total of 7 millions before the war.

Hydro-Electric Scheme in South India.—The Madras Government has agreed to instal a combined water supply and hydro-electric scheme from the Sriveni River for supplying Coimbatore and Podanur with water and electricity. The installation will cost over £250,000.—(*U.S. Com. Rep., June* 14, 1918.)

Hydro-electric Developments in Spain.—Hydro-electric industries have made considerable progress in Spain in recent years, and in course of time it is hoped that the country will be able to dispense with much of the coal imported from abroad. During 1917 500,000 h.p. of hydro-electricity was worked, and new schemes involving 15,000 and 12,000 h.p., at the falls in Asturias and in Valencia respectively, were commenced. Other schemes under construction are the Electra de Viesgo (Asturias) of 18,000 h.p., and Dos Aguas (Valencia) with a potential capacity of 60,000 h.p., of which it is intended to use only 20,000. Several new companies were formed in 1917, of which the two chief were capitalised at 100 million and 25 million pesetas (peseta = $9\frac{1}{2}d.$). The progress of hydro-electric industries after the war is expected to be enormous.—(*Bd. of Trade J., July* 18, 1918.)

Electric Power Developments in Sweden and Scandinavia.—H.M. Minister at Stockholm reports a number of new developments, and increases in capitalisation of companies connected with the supply of electric power. A project has been put forward by which the three Scandinavian countries would co-operate as regards the distribution of water-power. Denmark, which has no water-power, should receive power from Sweden, provided that the latter country could obtain a supply of energy to the Trollhättan Power System from the waterfalls in the south of Norway. Norway could in this way obtain a higher price for the power exported than she can obtain by using it for chemical industries in the country itself. This project has aroused considerable interest in the three Scandinavian countries.—(*Bd. of Trade J., July* 18, 1918.)

The Sulphite Spirit Industry in Norway and Sweden.—The yearly production of sulphite cellulose in Norway is about 210,000 tons. The waste lye contains about 160,000 tons of organic matter, representing 32,000 tons of sugar, from which up to 17 million litres of alcohol could be made, a quantity which would more than cover the Norwegian requirement of motor fuel. From the residual lye

left after the production of sulphite spirit, fuel may be obtained, either by evaporation, which is the more wasteful process, or by precipitation. One method of precipitation yields a fuel with a heat value of 6,000 calories. Dry distillation of the organic residue yields methyl alcohol, acetone, acetic acid, tar, coke, and combustible gases. Tanning extract is obtained from it at Embretsfos. In concentrated form the residue may be used as binding materials in briquette manufacture, in iron and steel founding, and for the production of size for paper-making. The best method of concentrating the lye is said to be by freezing; to apply it to the whole of the lye produced in Norway would require about 4,000 h.p.

The four established sulphite spirit factories in Sweden produce about 3 million litres of spirit per annum. Four more factories are just starting with a combined output of 1½ million litres, and no less than ten new works, with an output of 12 million litres, will be put into commission during the current year. Finally, some six or seven sulphite mills are planning the erection of plants, which will produce about 12 million litres. The maximum annual output of sulphite spirit (100%) in Sweden should reach 36 million litres in the most favourable circumstances. It is, however, not expected that sufficient will be available to remedy the shortage of fuel spirit before next year.—(*Bd. of Trade J., July* 18, 1918.)

Iron Ore in Sweden.—Sweden's wealth in iron ore, which is of special and great importance to German industry, is shown by the latest surveys to be practically inexhaustible. The most extensive ore-fields of Sweden lie in Lappland, within the Arctic circle, and cover an area of about 800 square kilometres. A second large tract of iron-bearing strata lies in the middle of Sweden, between 59 and 61 degrees of latitude, and covers an area which, with the Lappland field, makes up an extent of 1638 square kilometres. To these must be added a number of smaller areas not yet worked but brought prominently into notice by the needs created by the war. A recent survey of the ore-fields of middle Sweden shows an available supply of at least 137 million tons, to which may be added 40 millions of reserves in the yet only partially surveyed districts. In Lappland the available quantity of iron ore is not less than 1335 million tons. In Kirunavara alone there is in sight some 200 million tons. These immense riches gave occasion to the construction of the railway to Narvick, the Norwegian export harbour and the fortress at the junction of the northern main railway line with the Lulea Gallivare line. The iron content of the Swedish ores is on the whole high. This is especially the case with the Lapp ores, which reach an average of 60 per cent.—(*Z. angew. Chem., May* 3, 1918.)

Proposed Blast Furnace and Steelworks in Holland.—A scheme has been proposed for the establishment of a blast furnace and steelworks in Holland by the joint action of the Government and private enterprise. A company will be formed with a capital of 25,000,000 gulden, of which 7,500,000 gulden will be supplied by the State. It is intended to stimulate the imports of ore and to produce pig-iron. The steelworks will produce shipbuilding material and machinery, and according to estimate they will have a capacity of 150,000 tons a month. The coke ovens attached to the blast furnace plant will be equipped for the recovery of tar, ammonia and other by-products.

A group of Dutch capitalists who are interested in the development of the Limburg coalfield has applied to the Government for a concession to prove the iron deposits near Winterswijk.—(*Coll. Guard., Aug.* 2, 1918.)

Black Millet as a Source of Fibre and Alcohol.—Among the substitutes for fibrous materials to which German manufacturers have been compelled to have recourse is the black millet (*Sorghum vulgare*). It has found a place in paper-making, and it is now suggested as a material for the production of alcohol. The food-value of the grain is high, between that of peas and lentils, so that its cultivation, which costs no more than that of wheat or rye, is recommended to the farmer on the ground of its being a paying crop. If the "straw" be used as a source of cellulose or of alcohol, the crop becomes doubly valuable.—(*Z. angew. Chem., April* 23, 1918.)

Fats and Oils in Germany.—Before the war the annual production of vegetable oils in Germany was about 20,000 tons, of animal fats, exclusive of cheese, about a million tons, and of mineral oil some 150,000 tons. To meet the demand there were imported 270,000 tons of animal fats, 570,000 tons of vegetable oil, and a million tons of mineral oil. The demand for animal fats may be satisfied by the home production, which in times of peace could be greatly increased. Among the imports of animal fats, American produce figures largely. Vegetable oil came for the most part from overseas, but largely in the form of fruit from which the oil was extracted in Germany, such as linseed, rapé-seed, cotton-seed, palm-kernels, soya beans, sesame, etc. These have been imported from Africa, South and East Asia, and the Argentine. In recent years oil instead of soya beans has been imported from East Asia. The chief source of mineral oil has been the United States; in the future it is likely to be Rumania.—(*Z. angew. Chem., May* 14, 1918.)

Prize-Essays at the Berlin Technical High School.—The following theses have been set for competition among the students of the Technical High School at Berlin for 1918-19:—*Chemical.* To discover an inorganic condensing agent which will convert the unsaturated constituents of coal tar oil into resinous substances which are colourless or nearly so. *Mining.* To what extent would the application of vacuum drying to lignite (as mined) for the purpose of briquetting be advantageous, technically and economically? *General.* The limits of cost of substituting electricity as a source of power for coal and oil fuel, with reference to the probable future realisation of this substitution in Germany, and its general significance.—(*Chem.-Zeit., May* 22, 1918.)

Substitutes in the German Electrical and Gas Industries.—Aluminium, iron, and zinc have replaced copper almost everywhere in the electrical industry. Zinc wires are drawn by a new process, with the result that they resist practically the same mechanical stresses as copper. Wires are no longer tinned, substitutes being used instead of copper, and where protection against rust is absolutely necessary, such is given by using zinc or cobalt. Cadmium replaces tin for soldering or welding, or other means of manufacture are employed. Chrome steel is used instead of wolfram in the production of magnets. Contacts are made of an alloy of palladium and steel instead of platinum. Aluminium has proved to be such a valuable substitute for copper in the manufacture of wires that its use is to continue after the war. Fibrous materials compounded with insulating preparations are used extensively, either alone or combined with synthetic or regenerated rubber; these now replace pure and vulcanised rubber in the manufacture of wiring. For high tension cables impregnated paper is used exclusively.

Great increase in the use of gas for heating and cooking has led to an enormous demand for meters. While it has been found impossible to dispense entirely with the tin, copper and anti-

mony formerly used in their manufacture, the consumption of copper has been much reduced, *e.g.*, 50 grms. of brass is made to serve instead of 2 kilograms.—(*Norddeut. Allgem. Z., June* 11 *and* 19, 1918.)

USE OF LOW-GRADE MINERALS IN GERMANY.—Whereas formerly copper schists containing 2·5 per cent. of metal were regarded as barely payable, at the present time ores with 1 or even 0·7 per cent. are now worked. There has not been much change as regards iron and steel, but poor pyrites and phosphatic ores are no longer rejected. The vanadium for steel is recovered from slags containing not more than 0·7 per cent. of the rare metal; wolframite from old waste heaps is used as a source of tungsten; chrome ore of 24 per cent. is regarded as worthy of treatment, and nickel ores are worked if they contain 1·5 per cent. of nickel. Bauxite containing 40 per cent. of aluminium is considered sufficiently rich; and sulphur is extracted from gypsum and anhydrite.—(*Stahl u. Eisen. Bd. of Trade J., July* 11, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Oil Production.

In reply to Mr. G. Lambert, the Chancellor of the Exchequer stated that Messrs. S. Pearson and Sons had offered to place the whole of their geological and oil expert staff gratuitously at the disposal of the Government. The firm wished that before actual boring was commenced, a Bill should be introduced to restrict indiscriminate boring for oil. Messrs. Pearsons are acting as the agents of the Government, but it is not proposed to grant them a monopoly.—(*July* 30.)

On August 1, the Minister of Blockade (Sir L. Worthington Evans) introduced a Bill respecting the searching, boring for, and getting petroleum. Owing to the previous Bill having contained controversial proposals it was not proceeded with. The main object of the new Bill was to protect oil pools by preventing indiscriminate and wasteful borings, and all controversial matters, *e.g.* legal questions concerning ownership, were left by it to be settled after the war. Under the Bill, the Minister of Munitions is given power to grant licences to bore and to take compulsory possession of land. There is power to inspect plans of workings. The term "petroleum" includes natural gas. The Bill passed the Commons on August 5.

Linseed Oil.

Answering Sir R. Cooper, Mr. Clynes said: The United Kingdom Linseed Oil Consumers' Association was formed for the purpose of allocating linseed oil to the various trades for which supplies are required. Allotments in excess of 5 cwts. monthly are only made to members of the association, but any trader is eligible for membership at an annual subscription of two guineas. The membership exceeds 400. The members of the committee which determines the allocation of linseed oil are elected by the association, and are necessarily representative of firms interested in the trades eligible for membership.—(*July* 31.)

Foreign Dyes.

Sir A. Stanley, in reply to Mr. Samuel, stated that there is no intention that the agreements which will be entered into with manufacturers of dyes shall include any provision relating to the exclusion of foreign dyes from this country.—(*July* 31.)

Patents in War Time.

Replying to Sir F. Hall, Sir A. Stanley said that, as far as he knew, no patents have been taken out by British subjects in Germany since the commencement of the war, but numerous applications for patents have been made in Germany by British subjects under the licence issued by the Board which has recently been rescinded. The German Government followed the practice of the British Government in allowing applications for patent rights to be recorded, but refusing the grant of a patent on such applications. Enemy patent rights existing in this country on the outbreak of war were not voided as a whole, but the Board of Trade took powers to suspend or void any such patents or to grant licences to British subjects thereunder on the application of any person interested. No licences have been issued to Germans under these powers, but in the case of licences issued to British subjects royalties have been fixed in the majority of cases payable to the Public Trustee.—(*July* 31.)

In a reply to Sir H. Elverston, Sir A. Stanley said it was hoped to introduce after the Recess a new Bill dealing with the question of the extension of the life of patents.—(*Aug.* 7.)

Pottery Industry.

The Minister for Reconstruction informed Col. Wedgwood that he had been fully informed by a deputation from the pottery industry concerning the serious difficulties which confronted it. He was in communication with the Coal Controller as to the steps to be taken to prevent the industry being closed down.—(*July* 31.)

Imports and Exports Bill.

Mr. Bonar Law intimated that it was the intention of the Government to proceed with the above Bill as soon as possible after the House resumed. —(*Aug.* 7.)

Irish Flax Industry.

Mr. H. Fisher, answering Mr. MacVeagh, said that the Department of Scientific and Industrial Research is negotiating with the Irish linen manufacturers for the establishment of a Research Association. A local committee of manufacturers has been formed to draft the requisite memorandum and articles, and to obtain the support of the industry. The association will, it is hoped, include all districts.—(*Aug.* 7.)

Irish Kelp.

Mr. Boland asked the Chief Secretary for Ireland whether, in view of the fact that 4150 tons of kelp of the estimated value of £31,125 was exported from Ireland in 1916, any steps have been taken to increase the output during the present season. Mr. Shortt, in reply, said that the Department of Agriculture and the Congested Districts Board have not considered it necessary to take any special steps to increase the output of kelp in Ireland during the present season, the increase in price being a sufficient inducement to kelp burners to produce as much as possible. There is at present a keen demand for kelp by flax growers and manure manufacturers owing to shortage of potash.—(*Aug.* 8.)

Cellulose Acetate.

Replying to Sir F. Hall, Mr. Kellaway said that the Ministry of Munitions inherited the original contract made between the War Office and the British Cellulose Company in 1917. No financial assistance has been given to the Cellonite Company of Basle; and he had no information as to the amount of German capital invested in that company.—(*Aug.* 8.)

LEGAL INTELLIGENCE.

VALIDITY OF PRE-WAR CONTRACT. *The Western Counties and General Manure Co., Ltd.* v. *Compagnie des Phosphates du Dyn.*—In the King's Bench Division on July 2 and 3, before Mr. Justice Rowlatt, the English company, of Torpoint, Cornwall, claimed damages against the French company, of Paris, for alleged breach of a pre-war contract for the sale of 3000 tons of dried Tunisian phosphate.

Mr. H. Gregory, for the plaintiff company, said the goods were sold c.i.f. at Plymouth, none had been delivered, and the damages claimed amounted to £6000—£7000. The defendant company maintained that by a Tunisian decree the production and export of phosphate was prohibited, but this simply meant that it could not be dealt with without a licence. The French company also alleged that before the breach his clients agreed to take the goods f.o.b. upon an allowance of 6*s.* per ton being made for freight, that being almost the cost of freight when the contract was made. This arrangement was denied by his clients, who said it had reference to an entirely different contract.

Mr. Greer, for the French company, pleaded that the f.o.b. arrangement was intended by the parties to cover all purchases during the war. Every one else was willing to accept f.o.b. terms except the plaintiff company.

His Lordship, in giving judgment, said that he held that the f.o.b. terms substituted by the defendant were deliberately assented to by the plaintiff for the period of the war. All the people in Plymouth were taking deliveries of freights on f.o.b. terms. He therefore gave judgment for the defendant company, with costs.

SOAP CONTRACT DISPUTE. *Greathed and Humbert, Ltd.* v. *Oakley, Sollas & Co., Ltd.*—On July 3, before the Court of Appeal, composed of Lords Justices Pickford, Bankes, and Scrutton, an appeal was heard brought by Oakley, Sollas & Co., Ltd., of London, against a judgment given by Mr. Justice Bailhache in April last in favour of Greathed and Humbert, Ltd., of Cannon Street, E.C., for £750 and costs, in an action brought by the latter to recover damages for an alleged breach of contract.

The plaintiff company, in their action, said that by various contracts in writing signed by a Mr. Thyssen, agent for and chemical manager to the defendant company, the plaintiffs sold the defendants various quantities of vegetable soap. It was provided that a confirmed credit should be opened by the defendants in the name of the plaintiffs at the Banca Commerciale Italiana to cover the delivery. By a letter of October 12, 1917, the plaintiffs told the defendants that certain of the soap under one of the contracts was ready for delivery, and requested the defendant company to open the credit, which it failed to do, and by letters of November 12 and November 19, 1917, repudiated the contracts and the authority of Mr. Thyssen to sign the same. Subsequently the defendants agreed to accept 20 tons, but failed to take delivery in all of 980 tons. The plaintiffs had bought at £40 5*s.* per ton from Is. Poliakoff and Co., Ltd., by contracts made in October, 1917, and would have made a profit of 35*s.* per ton. In consequence of the defendants' breach, the plaintiffs resold to Poliakoff and Co. at £40 5*s.* Mr. Justice Bailhache had held that there was ratification of Mr. Thyssen's authority by the defendants, and had given judgment for the plaintiffs for £750 and costs.

After hearing the arguments, which turned on the point of Mr. Thyssen's authority, Lord Justice Pickford, in delivering the judgment of the Court, said that it could not be accepted that the manager of the chemical department would have authority to make contracts for the defendants unless it was strictly proved by evidence. The case of actual authority had been negatived by Mr. Justice Bailbache, and there was not sufficient evidence on which a case of ostensible authority could be founded. The defendant company therefore was not liable, and the appeal would be allowed, with costs.

PALM KERNEL OILS CONTRACT. *Olympia Oil and Cake Co., Ltd.*, v. *McAndrew, Moreland & Co., Ltd.* This case was heard on July 15 before Lords Justices Pickford, Bankes, and Scrutton, sitting in the Court of Appeal. The plaintiff company appealed against an order of the Divisional Court (this J., 1918, 266 R) dismissing a motion to set aside the award of the arbitrators in favour of the defendant company, which had purchased from the plaintiff company palm kernel oils that had not been delivered.

Lord Justice Pickford, in delivering judgment, said that he thought the appeal failed on certain points, but on one the appellant company was entitled to succeed. As to the complaint of the appellants that Mr. Watson's evidence was not admitted, he agreed with Mr. Justice Sankey that what Mr. Watson was to prove, if he was called, was left extremely vague. The arbitrators took the view that they had adjourned enough to enable the sellers to prove this defence, and they would not adjourn again. In his view the arbitrators took a correct course, and their discretion had been rightly exercised.

It was said that the award of the arbitrators was bad on the face of it, as they had made an award which was in excess of their jurisdiction because they had stated their award in alternative form. He thought that on this point there had been an excess of jurisdiction. In his view the arbitrators had no right to impose conditions binding either party taking advantage of the award, and therefore the award was bad and should be set aside, but as the other members of the Court disagreed with him the appeal would be dismissed, with costs.

SAMUEL MEGGITT AND SONS, LTD.—In the Chancery Division on July 16, Mr. Justice Younger heard the petition of the Board of Trade under the Trading with the Enemy (Amendment) Act, 1916, for the winding up of Samuel Meggitt and Sons, Ltd.

Mr. J. Austin-Cartmell (for the Board of Trade) said the company was formed in 1903 to take over an earlier company at Nottingham, the business being that of chemical manure manufacturers. For a time the new company was successful, but in 1912 the business declined and in 1913 a German group, through a Belgian firm, obtained a controlling interest in it.

The Board of Trade came to the conclusion that this was a company which fell within the terms of the Act of 1916, and ordered that the business should be wound up. This had now been done and the whole of the assets realised and the debits provided for. A new company, purely English, had been formed to take over the business under the title of Meggitts (1917) Ltd.

His Lordship made the order.

LICENCES TO USE ENEMY PATENTS.—In the Patents Court on July 25, the Comptroller granted the application of British Dyes, Ltd., of Huddersfield, to use the following patents relating to the manufacture of dyes and intermediates held by the Badische Anilin und Soda Fabrik:—Nos. 20633 and 7418 of 1908, nos. 1970, 7291, 15146, 15147, 25906 of 1912, 13149/1914 and 5692/1915. The application for the

last two was for the grant to be vested in the Public Custodian.

On August 1 the same company applied for licences to use the following 19 patents held by the Farbwerke vorm. Meister, Lucius und Brüning of Höchst a/Main:—Nos. 2797/1906, 2592, 2769, 8162 of 1907, 9633, 12130, 17087, 24569 of 1910, 13550, 23110 of 1911, 6080, 12378 of 1912, 9960, 10875, 11096, 15163 of 1913, 12239, 12819, 14869 of 1914. The last four of the series being unsealed, the application was for the right to be vested in the Public Custodian. The Comptroller recommended the granting of the licences on similar terms to those adopted in the case of previous applications (see this J., 1918, 99 R, 131 R).

An Enemy Chemical Work.—In the Patents Court, on July 24, Messrs. Scott, Greenwood and Son, publishers, applied under the Trading with the Enemy Act, 1916, for licences to translate and publish in this country the latest editions of the "Lehrbuch der Chemischen Technologie der Gespintstfasern," by Dr. G. von Georgievics, of Bielitz. Mr. Greenwood said that the rights of translation had been acquired in 1901, and editions had been produced in English under the titles of "Chemical Technology of Textile Fabrics" and the "Chemistry of Dye-stuffs." Keen demand had exhausted this first publication, and he now wished to print translations which would incorporate the material contained in the later German editions. Dr. Mason, of British Dyes, Ltd., was to translate the books and to adapt them to English practice. The application was granted.

REPORTS.

PRODUCTION OF FUEL OIL FROM HOME SOURCES.

Report of a Committee appointed by the Rt. Hon. the Minister of Munitions [Cd. 8128, 1*d*.]

A Committee of six members appointed by the Minister of Munitions, under the Chairmanship of the Marquess of Crewe, to consider the report which was rendered by the Petroleum Research Department on the production of fuel oil from home sources, and to advise to what extent and within what time it should be possible under present conditions to carry out the proposals made in this Report; and to consider the steps which have been taken by the Ministry of Munitions in this connexion, has issued its report.

The summary of its conclusions is stated as follows:—

(1) That the scheme for the carbonisation of cannel coal and kindred substances recommended in the Petroleum Research Department's Report was not a practicable one, and that the Ministry of Munitions was justified in declining to embark on it.

(2) That the alternative policy of developing the production of fuel oil from cannel coal and kindred substances in existing vertical retorts at gasworks should be developed so as to utilise some material of this class mined at the present time, but that the scheme should not be extended on any large scale until its general economic conditions have proved satisfactory.

(3) That the decision of the Ministry of Munitions to erect a battery of the Chiswick form of retorts was the right course to adopt in the circumstances.

The conclusions were arrived at on the following grounds:—

(1) (a) Low temperature carbonisation, except in its application in the Scottish shale oil industry, has not yet been proved industrially, and consequently the erection of large units of retorts to carbonise cannel coal and kindred substances could not be justified until success had been demonstrated on a reasonably large scale.

(b) A considerable period of time must elapse before the necessary retorts could be completed and brought into operation.

(c) A large expenditure of money, labour, and material would be involved in carrying out the scheme, which expenditure would be out of all proportion to the quantity of oil which could be produced.

(d) The requirements of coal at home and abroad would not permit the continued diversion of labour for the mining and bringing together of cannel coal for this purpose in sufficiently large quantities to ensure adequate supplies for large units of retorts.

(2) The evidence given has proved clearly that existing vertical retorts at gasworks can easily be adapted for the carbonisation of cannel coal for oil production, and oil has in fact been produced by this system. A sample of this oil has been tested at the Naval Fuel Depot at Haslar, and it has been found to be suitable for the utilisation as fuel for the Navy if mixed in certain proportions with petroleum taken from stock. Certain physical treatment is necessary, but refining by distillation or chemical treatment is not required. A daily production of 12,700 tons of cannel coal or kindred material could be attained, according to the Petroleum Research Department's Report, but this Committee's information reduces the quantity to about 2000 tons, practically the whole of which is either sold mixed with other classes of coal, or is sent to gasworks for gas-enriching purposes. Increased output of cannel coal could only be obtained at the expense of the output of ordinary coal.

(3) A committee was appointed in 1917 to investigate the advantages and disadvantages of three types of low temperature retorts; comparative tests were made, and the results appeared to be in favour of the form of vertical retort used in the Scottish shale oil industry. In view, however, of the strong representations of the Petroleum Research Department in favour of the installation of the Chiswick type of retort for the carbonisation of cannel coal and kindred substances, the Ministry of Munitions decided to instal a battery of thirty of these retorts at Nottingham, so that practical experience of their working on an industrial scale might be obtained under similar conditions to those prevailing at the Nottingham Gas Works, where cannel coal is being dealt with in the existing vertical gasworks retorts which have been adapted for the purpose. A true comparison on an industrial scale between the two systems of carbonisation should thus be obtained.

The Committee indicates other sources of supply as available in the future. These sources comprise boring for oil in Great Britain, further development of the Scottish shale industry, utilisation of dehydrated tar by the employment of suitable solvents, increased carbonisation of raw coal as a preliminary to its use for industrial and domestic purposes, and utilisation of the extensive deposits of Kimmeridge shale which occur in a belt that crosses England from S.W. to N.E. and of the extensive peat deposits in the United Kingdom.

THE PRODUCTION OF OIL FROM CANNEL COAL AND ALLIED MINERALS.

A few days before the issue of the Government Report on the same subject (*v.s.*) appeared an interim report of the Committee appointed by the Council of the Institution of Petroleum Technologists, to obtain evidence in respect of the quantity of cannel coal and allied minerals available in Great Britain as a source of motor spirit, fuel oil, and other products, and to formulate a scheme for the utilisation of such supplies.

The possibility of obtaining oil in quantity from low-temperature distillation was considered from two points of view, *viz.*, as an immediate war measure and as a permanent commercial undertaking. The essential work of the committee was carried out by four sub-committees appointed to consider supplies of material, treatment of material, costs, and a financial scheme, respectively.

The conclusion is arrived at that a very large amount of retortable material (much of it hitherto wasted) is available in Great Britain for the production of oil. Such material will yield 15—80 gallons of crude oil per ton, and the crude oil can be refined to give at least 8 per cent. of spirit and 50 per cent. of fuel oil. Provided the necessary labour and transport facilities were forthcoming, 10,000 tons per day could be assembled for treatment, from which a yield of 400,000 tons of crude oil per annum could be secured. The development of the industry on a permanent basis depends upon the utilisation of the by-products and residues, and the recovery of certain valuable constituents would help to relieve the shortage of fuel for domestic and industrial purposes. Such an industry would afford many openings for the employment of unskilled surface labour.

The residues obtained from caking material would provide a clean smokeless fuel of high calorific value, and those from non-caking material, high in ash, could be used for the production of power gas and ammonium sulphate. The residues from a non-caking coal, low in ash, could be used for briquette manufacture. Such utilisation of residues from non-caking material should greatly facilitate the schemes recently put forward for generating cheap electric power.

As the materials to be treated vary widely in nature and in their behaviour on heating, no one type of retort is recommended for adoption, but no difficulty is anticipated in obtaining the retorts best fitted for the particular material to be treated.

The committee regards with apprehension the situation as to the supply of fuel oil and motor spirit and the long delay in taking action to develop home supplies. It, therefore, strongly urges the adoption of the following recommendations:—

(1) That the War Cabinet should be invited to lay down a definite policy for the guidance of the Departments as to the relative national value and importance at the present time of oil and coal, the provision of the necessary labour, raw materials and transport.

(2) That the Government should afford all necessary facilities to those who are prepared to find the capital and take the risk for the erection at suitable centres of plant for the treatment on a commercial basis of the material known to exist.

(3) That an experimental station be established forthwith, so that retorts of any design provisionally approved by the Institution of Petroleum Technologists can be erected and tried out, and material tested with a view to ascertaining its character, oil yield and residual values.

(4) That such experimental station shall be maintained by and at the expense of the Government: or alternatively

(5) That the Government shall afford all necessary and reasonable facilities to the Institution of Petroleum Technologists for the erection of a testing station of its own.

TRINITROTOLUENE POISONING.

In his recently issued Annual Report on Factories and Workshops for 1917 (Cd. 9108, 3*d.*) the Chief Inspector (Dr. T. M. Legge) includes a special report written by himself on the subject of TNT poisoning.

In 1901 Drs. White and Hay demonstrated that the skin was the chief channel of absorption in poisoning by dinitrobenzene, but they pointed out that TNT was not poisonous in ordinary use. In this way they unintentionally obscured the issue in the cases where TNT was used on a large and extraordinary scale, and at the outbreak of war no particular precautions were taken beyond the removal of dust and fumes by local ventilation. Dr. Moore then showed that, as with dinitrobenzene, trinitrotoluene was also chiefly absorbed through the skin, and the principle of "clean working" was adopted as the best preventive.

Several fatal cases of poisoning occurred in 1915 and the post-mortem examinations disclosed the presence of jaundice and diseases of the liver and kidneys, similar to those caused by tetrachlorethane. After this very careful medical supervision was exercised and toxic jaundice was made notifiable. The effects of TNT on the human system are numerous, beginning with local skin irritation—which yields to ordinary dermatitis treatment; irritation of the digestive organs causing gastritis and vomiting; the formation of methæmoglobin in the blood thus lowering the oxygen content of the latter and giving rise to trouble in the liver, kidneys, and the circulatory system; acute liver disease causing jaundice of which 25—30 per cent. of the cases are fatal; and lastly, in rare cases, aplastic anæmia, the destruction of the red marrow of the bones, which usually terminates fatally after 5 or 6 weeks. TNT poisoning may manifest itself by a combination of any of the above symptoms.

Since the notification of toxic jaundice was initiated the following statistics have accumulated. The figures in the first line show the total number of cases in each quarter of the year, while the small index figures are the fatalities (included in the total figures):—

1916	1917	1918
6^{4} 16^{5} 73^{21} 86^{22}	83^{12} 56^{20} 21^{8} 29^{1}	13^{4}
Total for year 181^{52}	Total for year 189^{41}	
Males ... 70^{21}	Males ... 45^{2}	
Females 111^{31}	Females 144^{42}	

As an attempt to explain the higher female mortality it is pointed out that 61·5 per cent. were 25 years of age or under, while of the male cases only 14·6 per cent. were below 25.

The critical time for the onset of toxic jaundice is during the second, third, and fourth months, but a remarkable feature is that in a few cases the poisoning has remained latent for many months. Thus a woman who had worked with TNT for 2 months was transferred to other work, and after 7 months sustained a minor accident, toxic jaundice developed in a week, and in two weeks the case ended fatally. For every case of jaundice notified it is estimated that 30 cases of minor illness occur: pallor, cyanosis of the lips, depression, and gastritis. It is difficult to get an accurate figure for

the number of people handling TNT, but assuming it to be 50,000, the above statistics work out at 3·7 cases (including 1·0 fatalities) per 1000 persons per annum.

It is not easy to allocate all the cases to the various processes in which they have been incurred, but the 1917 figures indicate the melthouse, the stemming and pressing, and the bag-filling processes as causing the greater number of cases. Practically all the cases occur in the filling factories; the actual manufacture of TNT has given rise to very few cases. In the manufacture, the workers do not come in contact with nor handle the material as in the filling processes. The use of gloves to prevent skin absorption was not found to be satisfactory, and these are now regarded more as a source of danger than a safeguard. The continuous wearing of respirators has also proved unsatisfactory. The chief preventive measures taken are:—Medical supervision; general welfare work; alternation of employment in fortnightly periods; the use of mechanical handling wherever possible; cleanliness; and the use of local exhaust ventilation.

In conclusion, the question of poisoning with nitrous fumes is considered. Repeated small doses of such fumes affect the mucous membranes, and although the workers seem to get inured to some extent, they often suffer from what they term "bronchitis." Workers should be compelled to wear woollen helmets supplied with compressed air when making repairs, etc., in places where fumes are present. Exhaust ventilation in the form of cast-iron pipes fitted with a steam injector should be adopted over still manholes and in places where carboy filling takes place.

GOVERNMENT ORDERS AND NOTICES[1]

RADIO-ACTIVE SUBSTANCES CONTROL ORDER, 1918.

The Minister of Munitions under date of August 13 gives notice and orders:—

1. The Order applies to all radio-active substances (including actinium, radium, uranium and thorium, their disintegration products and compounds), luminous bodies in the preparation of which any radio-active substance is used, and ores from which any radio-active substance is obtainable, except uranium nitrate.

2. No person shall purchase, offer to purchase or take delivery of, or sell, offer to sell, supply or deliver any substance to which this Order applies, except in accordance with the terms of a licence granted by the Controller of Optical Munitions, 117, Piccadilly, W. 1.

3. All persons shall furnish returns of their stocks of radio-active substances to the Controller of Optical Munitions.

DRUGS FOR THE TROOPS.

The following additions have been made to the Schedule of the Army Council Order of June 5, 1918 (this J., 1918, 251 R):—Acetanilide, phenacetine, and any salts, preparations, derivatives, or admixtures prepared therefrom or therewith. (Aug. 8.)

PETROLEUM PRODUCTS (CONTRACTS) ORDER, 1918.

By this Order, dated August 13, 1918, all contracts for the sale, delivery or supply of any of the petroleum products to which the Petroleum Products (Wholesale Prices) No. 2 Order, 1918 (this J., 1918, 307 R), applies, are abrogated except such as provide for sale, delivery or supply at the prices named in that Order.

CAST IRON SCRAP ORDER, 1918.

The Minister of Munitions issued an Order on August 20 last controlling cast iron scrap, and making additions to the General Permit of November 1, 1916, fixing maximum prices for different classes of material. Additions and modifications of the same Permit and of subsequent modifications thereof, relating to second-hand rails and wrought iron scrap, are also included. Communications to: The Controller of Iron and Steel Production, Room 101, Ministry of Munitions, 8, Northumberland Avenue, W.C. 2.

IRON AND STEEL SCRAP DISPOSAL ORDER, 1918.

On August 20 the Minister of Munitions ordered that every owner of iron or steel scrap shall sell and transfer it whenever required by the Controller. If the Order be not complied with within thirty days, the Controller may sell or transfer the scrap, the owners receiving the price realised, less costs of sale. Applications to be made to the Controller of Salvage and Stores, Ministry of Munitions, Whitehall Place, S.W. 1, and marked "Iron and Steel Scrap."

OTHER ORDERS.

The Raw Cotton (Prices and Returns) Order, 1918. Board of Trade, July 29.

The Woollen and Worsted (Consolidation) Amendment No. 2 Order, 1918. Army Council, August 2.

The Leather (Shipment to or from Ireland) Order, 1918. Army Council, August 6.

Silver Bullion (Maximum Price) Order. H.M. Treasury, August 9.

The Spirits (Prices and Description) No. 2 Order, 1918. Food Controller, August 13.

PROHIBITED EXPORTS.

Further amendments in and additions to the list of articles of which the exportation from the United Kingdom is prohibited were made by an Order in Council of August 6. They are:—

1. *That the following headings should be deleted*:—(B) Ammonia and its salts, whether simple or compound, and mixtures containing such salts (except ammonia liquor, liquefied ammonia, ammonium alum, ammonium carbonate, chloride, nitrate, perchlorate, sulphate and sulphocyanide, and nickel ammonium sulphate, and mixtures containing such ammonium salts); (A) Ammonia, liquefied; (A) Ammonia liquor; (A) Ammonium alum and mixtures containing ammonium alum; (A) Ammonium carbonate and mixtures containing ammonium carbonate; (A) Ammonium chloride, including muriate of ammonia and salammoniac, and mixtures containing these substances; (A) Ammonium nitrate and mixtures containing ammonium nitrate; (A) Ammonium perchlorate and mixtures containing ammonium perchlorate; (A) Ammonium sulphate and sulphocyanide; (A) Barium sulphate; (A) Indigo, natural and synthetic; (A) Nickel ammonium sulphate and mixtures containing nickel ammonium sulphate; (C) Sodium bicarbonate; (B) Tar, vegetable.

2. *That the following headings should be added*:—(C) Acid-resisting apparatus made of quartz and parts of such apparatus made of quartz; (A) Carbon, coke oven; (A) Carbon, pitch; (A) Ammonia and its salts, whether simple or compound, and mixtures containing such salts; (A) Barium sulphate and mixtures containing barium sulphate;

(C) Indigo, natural; (A) Indigo, synthetic; (A) Sodium bicarbonate; (A) Nicotine and its compounds: (A) Tar, vegetable.

Imports of Mechanical Wood Pulp.—The Board of Trade has given notice that Certificates of Origin and Interest will be required in respect of all consignments of wood pulp arriving from Norway, Sweden, Denmark, Holland, and Switzerland after August 31.

Imports from Finland.—The Board of Trade has notified that all goods arriving in the United Kingdom from Finland after September 12 will be required to be accompanied by Certificates of Origin and Interest issued by a salaried British Consular Officer in Finland. The requirement does not extend to goods of the kinds which need not be accompanied by such certificates when imported from Norway, Sweden, Denmark, Holland, and Switzerland.

The explosive "Ammonite No. 5" has been added to the list of permitted explosives under the Coal Mines Act of 1911. (Aug. 2, 1918.)

Corrigendum.—In the notice concerning the "Calorific Power of Coal Gas" in the last issue (p. 308 R), the word *not* should have appeared before "lower than 450 B.Th.U." in line 6.

OFFICIAL TRADE INTELLIGENCE.

OPENINGS FOR BRITISH TRADE.

(From the *Board of Trade Journal,* August 8, 15, and 22.)

Firms at Barcelona desire agencies for U.K. manufacturers of printing and lithographic inks; and for pharmaceutical products, perfumery, tanned skins, varnish, etc. [Ref. Nos. 218, 228.]

Firms at Bilbao desire agencies for U.K. manufacturers of foodstuffs, chemicals, ironware, earthenware, etc. [Ref. Nos. 226, 227.]

Importers at Turin desire to represent British manufacturers of chemical manure, waterproof covers for carts, etc. [Ref. No. 224.]

An agent at Amsterdam desires to represent British manufacturers of first-class soap and of candles. [Ref. No. 225.]

Firms at Calcutta desire agencies for U.K. manufacturers of machinery, paints and paper. [Ref. Nos. 230, 231, 232.]

A firm at Brisbane desires agencies for U.K. manufacturers of ink, paper, and cardboard. [Ref. No. 235.]

A Canadian company wishes to represent, more especially after the war, U.K. manufacturers of chemicals and drugs. A Canadian firm able to export certain strontium salts invites inquiries from British buyers. Inquiries should be addressed to the Canadian Government Trade Commissioner, 73, Basinghall Street, E.C. 2.

A firm at Alexandria desires agencies for U.K. manufacturers of chemical manures and mineral oils. [Ref. No. 240.]

British dealers in carnauba wax now in a position to supply are invited to make application to the Department of Overseas Trade for the name of an inquirer.

TARIFF. CUSTOMS. EXCISE.

Argentina.—The *Bd. of Trade J.*, August 15, gives the schedule of export duties for August. The list includes hides and skins, fats and tallows, oilseed cake, quebracho logs and extract.

France.—The *Bd. of Trade J.*, August 8, gives the consolidated list of the articles the export and re-export of which are prohibited. The list is a long one and includes chemicals, drugs, fats and oils, paper, starch and dextrin, hides, skins, and tanning materials, waxes, wood, etc.

The period of validity of import licences has been increased to six months.

The *Bd. of Trade J.*, August 22, gives a list of decisions of the French Customs Department with regard to the classification of certain articles under the French Tariff. The list includes alloys, cork, fats and oils, developers, silicon steel, oleic acid and olein, etc.

Gold Coast Colony.—It is proposed to levy an export duty of £2 per ton upon palm kernels, to come into force after the war.

Jamaica.—The export duty on sugar is repealed, but the duties on coconuts, hides and logwood extract remain in force until March 31, 1919.

Netherlands.—The export of horn and artificial horn (galalith, bakelite, etc.) in every form is prohibited as from July 5.

New Zealand.—The export of oils of all descriptions is prohibited as from May 13, save with the consent of the Minister of Customs.

The *Bd. of Trade J.*, August 15, gives a list of Customs decisions as to the classification of various articles under the Customs Tariff or their importation into New Zealand. The list includes benzol, lenses and glasses for motor-car lamps, bone black, scientific apparatus, etc.

Sierra Leone.—It is proposed on a date to be fixed by the Governor and notified by proclamation to levy an export duty which will remain in force for five years upon all palm kernels at the rate of £2 per ton. The duty will not be payable upon kernels exported to a port within H.M. Dominions or within a British Protectorate provided that a bond for the amount of the duty be given upon a prescribed form.

Spain.—A Royal Order, dated July 19, imposes an export duty on common soap at the rate of 10 pesetas per 100 kilograms.

United States.—The importation of gutta-siak (a variety of gutta-percha produced in Sumatra) not exceeding 740 tons from all sources will be allowed under licence for the remainder of this year.

A copy of the circular relating to the export of coin, bullion and currency may be seen at the Department of Overseas Trade. The *Bd. of Trade J.*, August 22, gives the new regulations governing the export of manufactures of gold.

The *Bd. of Trade J.* for August 15 gives further rulings of the War Trade Board with respect to the importation of certain articles. Among the articles effected are cacao, copra, copper ores, flaxseed and linseed, graphite crucibles, magnesite, manganese ores, tanning materials, etc.

Venezuela.—A copy of the new Customs law which took effect from July 1 may be seen by persons interested at the Department of Overseas Trade.

Tungsten Smelting in Italy.—With the sanction of the Italian Government, a factory for smelting tungsten ores has been erected at San Querico, Genoa, by Messrs. G. G. Blackwell, Sons and Co., Ltd., of Liverpool. The works, which are now completed and in full operation, have a capacity more than sufficient to supply the war-time requirements of Italy. In addition to the manufacture of ferro-tungsten, the factory has been equipped for the production of other ferro-alloys, and of the alloys of copper and aluminium with the rarer metals.

TRADE NOTES.

BRITISH.

Exports of Dyewoods, etc., from Jamaica.—Jamaica contains about 500,000 acres of forest, the greater part of which is not heavily timbered. In logwood and fustic she possesses two important dyewoods, the value of which has greatly increased during the war. Thus, logwood which sold at \$10—\$12 a ton now fetches \$21—\$25, while fustic, which sold at \$8—\$12 is now worth \$13—\$17. The exports have risen from a value of £300,000 in 1914 to £415,000 in 1915, and to £800,000 in 1916. The proportion of these which went to the United Kingdom in those years is as follows:—1914, 9%; 1915, 52%; 1916, 47·5%; the corresponding figures for the U.S.A. being 1914, 60%; 1915, 32%; 1916, 34%.

The exports in 1916 were made up of 1381 tons of fustic, 74,157 tons of logwood, and 28,477 packages of logwood extract.

A number of medicinal barks are known and used by the natives of Jamaica, but with the exception of bitterwood, exports of which in 1916 amounted to £2300, there is no foreign trade in these products.—(*U.S. Com. Rep., May* 3, 1918.)

FOREIGN.

Bichromate Manufacture in Sweden.—H.M. Minister at Stockholm reports that a large new factory has just been started at Malmö for the production of bichromate, chrome alum and other chromium compounds. The undertaking has been financed by Swedish and Danish interests, and the proposed scale of operations is sufficiently great to render importation of these materials unnecessary. Hitherto these have been imported from Germany and the United Kingdom to the value of 6—7 million kronor (=£365,000) per annum.—(*Bd. of Trade J., Aug.* 1, 1918.)

Japanese Graphite.—Graphite business in Corea during 1917 was good. The production was estimated at 6500 tons, of which 4500 was delivered to Japanese steelworks or exported to America, leaving a stock of 2000 tons. For the present year prospects are poor. Owing to American import restrictions, and the stoppage of the supply of arms to Russia, the two main outlets for graphite will be greatly curtailed. The home demand will not exceed 3000 tons, to meet which there is already the stock of 2000 tons above mentioned. A year ago the price was about £120 per ton, it is now below £80, as against a pre-war figure of £60. It is difficult to forecast the market price, but the production does not seem likely to decline, as new mining permits are still being issued.—(*Bd. of Trade J., Aug.* 1, 1918.)

Camphor Situation in Japan.—The production of camphor is restricted and supplies are now allotted on the basis of the consumption some years ago. Camphor is being sold by the monopoly at 120 yen per 100 kin (about 1*s*. 10*d*. per lb.), although in the open market it would easily fetch 2*s*. 6*d*. per lb. The demand for the material is increasing greatly, both in Japan and the U.S.A., and the Government intends to encourage the export of refined, rather than crude camphor.—(*U.S. Com. Rep., June* 10, 1918.)

Proposed Japanese-Chilean Nitrate Enterprise.—According to the *Japan Advertiser* efforts are being made to undertake the working of nitrate deposits in Chile under Japanese and Chilean joint management. There has been a steady increase in the import of Chilean nitrate into Japan; in 1917 it was 53,000 tons, as against 24,000 tons in 1914. At present the total consumption in Japan is about 60,000 tons. It is said that to obtain this quantity by working deposits in Chile requires a capital of no more than 2,000,000 yen.—(*Bd. of Trade J., Aug.* 8, 1918.)

COMPANY NEWS.

BRITISH DYES, LTD.

At a meeting held in Huddersfield on August 21, the shareholders of British Dyes, Ltd., approved of the proposed amalgamation with Messrs. Levinstein, Ltd.

The Chairman of the company (Mr. J. Falconer, M.P.), in moving that the proposed scheme be not approved, gave detailed reasons for the attitude he and five of his co-directors had adopted (this J., 1918, 308 R). The question of control and management was the most vital, and the former must be exercised in the interests of the industries concerned. Representatives of the largest Swiss dye firms were convinced that the Dupont agreement would prevent any effective co-operation between the Swiss and the English companies.

Mr. G. P. Norton, who with Mr. J. Turner had issued a minority report in favour of amalgamation, recognised the necessity of preventing any individual or party obtaining control by financial means, but held it to be impossible to prevent such action in any company whose shares possessed a free market. There would be no monopoly because foreign dyes which were not manufactured here would be admitted and sold at a reasonable price. He relied upon the Government safeguards to stop any abuse.

The motion was defeated on a show of hands, and the result of the poll, demanded by the Chairman, gave 168,185 votes for the motion and 487,039 against—an adverse majority of 318,854. Mr. Falconer thereupon intimated his resignation and also those of Messrs. Lee, Christie, Garnett, Hollins, and Dr. M. O. Forster. A committee of seven shareholders was appointed to assist in carrying out the amalgamation.

H. N. MORRIS & CO., LTD.

At the annual general meeting held recently in Manchester, the Chairman of the Company, Mr. Norris, stated that the subscribed capital had grown from £20,000 in 1909 to £121,537 in 1918, and that during the whole of this period the ordinary dividend had been maintained at the rate of 10 per cent., free of tax. By the sale of the Gorton Works to the Government, the Company had been enabled to purchase the works of the Trafford Park Chemical Co., where the manufacture of intermediates and dyes would be pursued. The Company's new electrolytic chemical works at Middlewich were an important development, and an interest had been taken in a new electrolytic cell, for the manufacture of chlorine and caustic soda, which was being erected on a large scale at these works. Part of the plant was started in March last. Much delay and extra expenditure had been incurred owing to a drafted agreement with a Government Department not having been completed. Mr. Norris then alluded to arrangements which had been made for co-operation with a Swiss interest for the manufacture and supply of dyes. He did not see how the Government plans, as at present disclosed, for establishing a natural dye industry could suffice to enable this country to compete in the open markets with the gigantic combinations of the United States and Germany. He also expressed dissent from the view that the chemical industry of the country should be divided into four main, water-tight, groups (see this J., 1918, 289 R). The different branches of the industry are so much inter-related, that the only feasible programme is to effect an amalgamation of all the interests concerned. The policy of the Company would be to concentrate on the production of certain intermediate products, and to make the best use of the Swiss connexion for the manufacture of dyes.

BRITISH PORTLAND CEMENT MANUFACTURERS, LTD.

The seventh annual meeting was held in London on July 30, Mr. F. A. White, the Vice-Chairman, presiding. There was an active demand for cement during the past year, said the Chairman, and notwithstanding an abnormally low output, the profits for the past year show an improvement, due to increased deliveries and to a larger yield from investments. In April last the Army Council required the whole production of cement in the country to be placed at its disposal, and in May the exportation was prohibited until further notice. The stir made in certain quarters regarding the export of cement to Holland for alleged enemy use was completely disproved by the Report of a British Foreign Office Committee. Germany has not only ample cement for her needs, but enough to export to Holland. "If, therefore," says the Report, "this country could supply Holland with the whole, or even a substantial part, of her requirements of cement, one of Germany's instruments of pressure could be removed, or at any rate greatly mitigated." The Committee recommended the immediate resumption of the export to Holland when the political situation permitted.

The gross profit for the year ended April 30 last was £328,900, and the net profit £168,500, against £254,200 and £140,900 respectively in the previous year. The relative decline in the net profit is due to increased administrative costs. The dividend on the ordinary shares is raised from 4 to 6 per cent., and £87,700 (against £73,000) is carried forward.

SOUTH METROPOLITAN GAS CO.

The directors' report for the half-year ended June 30 last states that the increase in the price of gas by 6*d*. to 4*s*. per 1000 cub. ft. did not allow any margin of working, and hence it is necessary to draw a further sum from reserve to pay the statutory dividend of £3 4*s*. per cent. on the ordinary stock. The relief proposed by the Government Bill to enable a 3 per cent. annual dividend to be paid, as compared with a pre-war rate of 5½ per cent., is a meagre recognition of the important help the gas industry has given in the production of munitions of war, but compares unfavourably with that accorded to most other industries. The Bill in Parliament to increase the capitalisation by £1,350,000 has passed unopposed through the Committee stage of the House of Commons.

Speaking at the half-yearly meeting held in London on August 14, Dr. Chas. Carpenter, the Chairman, vigorously combated the suggestion that the interests of the gas-using public were being disregarded. With regard to the fuel rationing proposals, it was unfortunate that no method had been adopted to bring home to the miners the great importance at all times of their industry. The wages bill of the Company had increased from £611,000 in 1914 to £1,022,000 per annum at the present time; a part only of the increase was justified by the greater cost of living. Depletion of coal stocks caused the Company the gravest anxiety for the coming winter, and the poor quality of some of the coal delivered needed immediate attention.

HOLZAPFELS, LTD.

At an extraordinary meeting held in London on August 1, it was decided unanimously that the name of the company be changed to "The International Paint and Compositions Co., Ltd." It was stated that the Board of Trade had consented to the change, that none of the capital was held by enemy aliens and less than 6 per cent. by British subjects of enemy origin.

Proposed Amalgamation between Alby United Carbide Factories, Ltd., and Nitrogen Products and Carbide, Ltd.—These two companies, which manufacture carbide and cyanamide respectively at Odde (Norway), propose to merge their interests in order that they may be able to take immediate advantage of any variation in the demand for the products, and so divert output to the channel which promises the more remunerative return. The Nitrogen Products company is in possession of very valuable and extensive water rights, and the Alby United company has a contract for hydro-electrical power at a low price over a long term of years. Treasury sanction having been obtained, it is proposed that the Alby United shall increase its capital to £2,350,000 by the creation of 1,625,000 new ordinary shares, ranking *pari passu* with the old. A portion of the reserve will be capitalised and distributed on the basis of one new ordinary share for every eight held. Nitrogen Products will go into liquidation and its shareholders will receive one fully paid ordinary share in the new company in exchange for every similar share in the old. Alby United, as the holder of 500,035 shares of Nitrogen Products, is not to receive any allotment of shares, nor to be liable to pay any sums unpaid in respect of its holding in that company.

PUBLICATIONS RECEIVED.

Ingots and Ingot Moulds. *By* A. W. *and* H. Brearley. *Pp.* 218. *(London: Longmans, Green and Co.) Price* 16*s*.

Bulletin of the Imperial Institute, Vol. XVI., No. 1, January—March, 1918. *Pp.* 126. *(London: John Murray.) Price* 2*s*. 6*d*.

Electrometallurgy: Electrolytic and Electrothermal Processes. *By* E. K. Rideal. *Pp.* 247. *(London: Baillière, Tindall and Cox.) Price* 7*s*. 6*d*.

Dyeing with Coal Tar Dyestuffs. *By* C. M. Whittaker. *Pp.* 214. *(London: Baillière, Tindall and Cox.) Price* 7*s*. 6*d*.

Copper. Circular No. 73 of the Bureau of Standards. *(Washington: Government Printing Office.) Price* 20 *cents*.

Comptes-Rendus des Travaux du Laboratoire de Carlsberg, Vol. 12. *Pp.* 372. *(Copenhagen: H. Hagerup.) Price* 14 *kr.* 75 *ore*.

Standardizing Welfare. An Address by Lord Leverhulme to the Students of Sheffield University, September 24, 1917. *(Port Sunlight: Lever Brothers, Ltd.)*

Preliminary Report of the Water-Board Committee of the Conjoint Board of Scientific Societies.

Publications of the United States Geological Survey, Department of the Interior. *(Washington: Government Printing Office.)*

- Fuel Briquetting in 1917. *By* C. E. Lesher.
- Gold and Silver in 1916 (General Report). *By* H. D. McCaskey *and* J. P. Dunlop.
- Arsenic, Bismuth, Selenium, and Tellurium in 1917. *By* J. B. Umpleby.
- Strontium in 1917. *By* J. M. Hill.
- Platinum and Allied Metals in 1917. *By* J. M. Hill.
- Bauxite and Aluminium in 1917. *By* J. M. Hill.
- Gems and Precious Stones in 1916. *By* W. T. Schaller.

REVIEWS.

SIR WILLIAM RAMSAY, K.C.B., F.R.S.: MEMORIALS OF HIS LIFE AND WORK. *By* SIR WILLIAM TILDEN, F.R.S. *Pp.* xvi + 311. *(London: Macmillan and Co., Ltd.,* 1918.) *Price* 10*s. net.*

The impression must remain on the minds of all who read this book how fortunate it is that a man was forthcoming who could treat his subject with such insight and such distinction. It is a charming story of the life of a man great in his science and great in his simplicity. It reveals Ramsay as he was to all who knew him, a man of true genius and a man of boundless enthusiasm, entirely unspoiled by success.

Sir William Tilden has been fortunate in the personal recollections of Ramsay that have been given him by many intimate friends, for these reveal the man himself more clearly than his letters are able to do, for so many of these, interesting as they are, tend more to show him as an excellent and at times humorous raconteur of his experiences.

No apology is needed for a quotation from Sir William Tilden's preface, in which he says: "I can claim an acquaintance with him of more than thirty-five years, and I can boast of a friendship of at least twenty-five. Nevertheless I feel it is only now that I know the man." These few words will perhaps justify a slight regret that so little is to be found in this book about Ramsay as he impressed himself on his students during the years 1894 to 1910, in which his best work was done. It is but a small thing to say that those who worked with him and under him then will always treasure a most vivid and lasting recollection of his astounding fertility of idea and experimental skill. To many his insight into the secrets of Nature was almost superhuman. Many will remember how their own faintheartedness was overborne by the infection of his enthusiasm. How many again can trace their own love of scientific investigation to the stimulus of Ramsay it is not possible to say. Further, in Ramsay's earlier years at University College, when his outside duties were less onerous, his keen interest in his students was remarkable. Ever impressing on them the value of personal observation, ever aiding them with earnest words of encouragement, ever possessed of great lucidity of expression, he was an ideal teacher, and lastly throughout his whole life he never allowed his memories of any student to fade from his mind.

Sir William Tilden devotes two chapters to Ramsay's earlier life, and then follow chapters on his life at Bristol and at University College from 1887 to 1894. In 1894, as every one knows, the first experiments on the isolation of argon were carried out, and this therefore marks the beginning of the great epoch in his life. The two following chapters describe Ramsay's work on the gases of the atmosphere and his work on radium. In these fifty pages is given a very striking account of the work for which Ramsay will be best known. In the chapter dealing with the rare gases the text is enriched with excerpts from letters to Lady Ramsay, showing how the earlier work progressed. The actual details of this work could hardly perhaps find a place in the present book, but possibly more reference might have been made to the experimental side. Previous to Ramsay's investigations the methods of work on gases were very embryonic, and he had to devise for himself entirely new means of handling very small volumes of gases and of determining their physical constants. Few chemists, if any, would previously have believed it possible to determine the density, refractivity, ratio of specific heats, and critical constants of a gas the total volume of which did not exceed 0·4 c.c. It is true that this feat was quite overshadowed by Ramsay's subsequent work on niton, but this latter was only rendered possible by the former.

To those who knew Ramsay two paragraphs in these chapters will appeal strongly. Reference is made to the somewhat unkind criticisms that were uttered at the time of the discovery of argon and its companions, and Sir William Tilden brands these in no uncertain fashion. More especially will be appreciated the truly philosophic reference to Ramsay's views on the possible transmutation of the elements under the influence of niton.

The last four chapters deal with Ramsay's later years, and include two which describe his views on education and his travels. Suffice it to say that these bear the same charm as those already reviewed. Sir William Tilden very rightly refers to Ramsay's extraordinary facility in speaking foreign languages. He himself was in the habit of belittling this gift by saying, "When one knows three languages well it is an easy matter to learn another." But his knowledge extended beyond those mentioned, for he was able to read papers in Czech and Hungarian as well as Rumanian.

The closing words of this book may fittingly be quoted: "We look back over the centuries, and among the founders and master builders of their science we see the outstanding figures of Boyle and Black, Lavoisier, Priestley and Scheele, Cavendish, Davy, and Berzelius with a few more. The stream of time bears along to oblivion the vast majority of the sons of men, and though in this age of scientific activity there is an ever-increasing army of workers, most of them are engaged in supplying merely the bricks of which the edifice of scientific knowledge is built. They have their reward in their own day and generation. The name of William Ramsay will always stand among those of the master builders."

E. C. C. BALY.

THE THEORY AND USE OF INDICATORS. *By* E. B. R. PRIDEAUX, M.A., D.Sc. *Pp.* xii + 375. *(London: Constable and Co., Ltd.,* 1917.) *Price* 12*s.* 6*d. net.*

The publication of a book of nearly 400 pages on indicators alone is striking evidence of the degree of specialisation in modern chemical science, and the novice who is beginning to use the time-honoured piece of litmus paper might well be aghast if he saw the end to which such practices may lead. An inspection of Dr. Prideaux's volume further reveals the extent to which physical chemistry has contributed to the interpretation and control of chemical changes and reactions previously known but employed in a haphazard manner. So far as indicators are concerned, a rational classification of these is now possible on the basis of the hydrion concentration at which the colour change occurs, and the whole subject of neutralisation is illuminated by our present day knowledge of the mass action law as applied to electrolytic equilibria.

Much discussion has ranged round the question of the origin of the colour change exhibited by indicators. On the one hand we have the ionic theory of colour, according to which all such changes, whether shown by indicators or inorganic salts in solution, are to be correlated solely with the state of electrolytic dissociation of these substances. On the other hand there is the theory which connects the alteration of colour with tautomeric change, and in the present volume the facts relevant to the two views are set forth in detail. It appears fairly clear that the ionic theory, however valuable it is in the quantitative treatment of neutralisation of indicators, is not of itself capable of furnishing a comprehensive and satisfactory account of the colour changes occurring in aqueous solution. Among the facts leading to this conclusion may

perhaps be mentioned the observation that the colour exhibited by phenolphthalein in an alkaline medium can be completely discharged by adding excess of sodium hydroxide.

The author takes as his starting point the equilibria of acids, bases and salts, and the various physical methods of determining acidity and alkalinity. Much space is devoted to a discussion of the colour of indicators as a function of the hydrion concentration, and to the methods of preparing and using solutions of standard hydrion concentration. The book contains also a summary of the principal indicators, with details as to their preparation and the conditions which should be observed in their use.

It is a pity that the labour spent in the accumulation and correlation of so much valuable material should be marred by an obvious lack of care in the preparation of the MS. or in the correction of the proofs. Numerous errors can be detected even on a cursory inspection of the book. Thus, for example, on p. 79 the formula of cupric chloride is given as $CuCl_2.24H_2O$; on p. 96, the formula for *m*-nitrophenol is labelled *p*-nitrophenol; on p. 100, the ring structure set out for derivatives of *m*-nitrophenol contains a hexavalent nitrogen atom; on p. 182, 0·0001N occurs instead of 0·001N; on p. 222, "water from the Atlantic Ocean containing 35·95 per cent. of total salt" is mentioned; on p. 295, CO is used instead of CO_2.

The most serious of the mistakes noticed by the reviewer is the erroneous description (p. 4) of Wijs' experiments on the effect of H· and OH′ in the hydrolysis of methyl acetate by water. It is stated that the velocity "reaches a maximum when [H·] and [OH′] are at a minimum, *i.e.*, at the neutral point." This is quite inconsistent with the results obtained by Wijs, who found that the concentrations of the hydrogen and hydroxyl ions at the point of minimum velocity were approximately as 1400 : 1, not 1 : 1, as Dr. Prideaux's account suggests.

J. C. Philip.

Dyeing and Cleaning: A Practical Handbook. *By* Frank J. Farrell, M.Sc. *Pp.* 253. *(London: Charles Griffin and Co., Ltd.) Price* 6s. *net.*

The fact that this volume is now in its fourth edition is testimony that it has been found useful. The author makes an endeavour to justify the sub-title and he succeeds admirably, although it must be admitted that in writing a volume of this kind the writer is perplexed as to what to include. In this instance, if the author is writing for the practical man, then his discussion of the chemical constitution of the hydrosulphites is out of place, whereas if he is writing for the trained chemist engaged in the industry, much of the explanatory matter is unnecessary. Considering both classes of readers, however, little criticism in this direction can be offered.

It is interesting to note that after the introduction of dry cleaning to this country from France, one British works quickly introduced machines, thus forming the basis of this huge industry. Moreover, it is evident that the industry has progressed on scientific lines in this country, and although international competition must be small in this branch of chemical industry, efficiency will tend in the direction of national economy.

The book is divided into seven chapters dealing with the technology of textile fibres, dry cleaning, wet cleaning, dyeing, dry dyeing, special methods and finishing. These chapters are very well done except the first one on textile fibres, which might quite well have been omitted, particularly as the author refers to other books on this subject in his preface. All books on textile subjects contain a similar chapter which has now become somewhat stereotyped, but the book under review is too good to justify such padding and the inclusion of this chapter could only be defended in the case of a reader having no other books on textile subjects. Perhaps this chapter might be substituted by one describing some of the textile materials, ranging from artificial silk to India-rubber, received by the cleaner for treatment. It is true that the author mentions a number of these materials in the body of the book, but a list and a few remarks, compiled from his long experience, would be of interest to his readers.

In the chapter on stain removal, which is particularly good, the use of aniline as a solvent is mentioned, but this liquid must be used with care and preferably in the open air, as aniline vapour causes sickness to those breathing it and produces a pink stain on white goods in the immediate vicinity. Tar stains are sometimes impossible to remove entirely from textiles; fat, such as butter, has been found a successful agent in some cases.

A notable feature of the book is the record of recent research, although other work on the effect of light on textiles, as regards their affinity for colouring matters, might have been mentioned besides the one paper referred to. Chemists in this and other branches of chemical industry will demand information concerning the bearing of research on their industry and, failing volumes dealing entirely with research work, text-books of this kind will do well to fill the want mentioned.

In some instances the author gives accounts of different substances used in cleaning, such as castor oil soaps and peroxides, and states the claims made for these agents whereas an opinion on their value would be of more interest, particularly considering the use of certain bleaching agents has recently been condemned by one authority. The statement that fibres become "hydrated" when immersed in water is doubtful and need not have been included.

The book should be in the hands of all technically engaged in the industry, and is also interesting to the general reader.

S. H. Higgins.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.* [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Induchem, Finsquare, London.*]

"LA GUERRE POUR LE MINERAI DE FER."

H. LOUIS.

The above heading is the name given to the European War in a recent French newspaper, and it aptly illustrates a point of view which, although well understood in France, and perhaps a commonplace amongst those in this country who are conversant with the modern trend of the iron and steel industry, is very insufficiently appreciated by the British people as a whole. Few in this country have yet realised that this war, so often described by Germans with shameless cynicism as waged in defence of the Fatherland, is in reality carried on with the definite object of robbing France of a valuable possession which Germany neglected to annex in 1871, only because its real nature was not then realised. This object was carefully concealed during the first years of the war, but has been unthinkingly avowed of late, although it is true that the avowal was made only when Germany perceived that her specious disguise had been seen through.

The position can only be understood when the nature and extent of the great iron ore deposits that extend through eastern France and western Germany are known. This vast deposit of an iron ore known as "Minette" (a French name, by the way) underlies an area some 60 kilometres long from north to south and 15 to 25 kilometres wide. The ore occurs in beds interstratified with marls, forming, apparently, the topmost beds of the Upper Lias. The total thickness of this minette formation is usually from 30 to 60 metres, and within this thickness there are in most places from 1 to 5 workable beds of iron ore; these beds are known as grey, brown, red, yellow, black, etc., the thickness of the individual beds ranging from 1·5 to 5 and exceptionally up to 7 metres: it is rare that any one section contains a thickness of more than 15 m. of workable ore in several beds. The structure of the ore field is extremely simple, the strata dipping gently, from 3° to about 7° to the west; it is on this account that the eastern boundaries of the iron ore beds can be accurately defined by their outcrops, but the limits of their extension to the westward are not everywhere known. It was at first thought that these deposits could only be worked at and near their outcrops, but recent investigations have shown that the workable ore has very important extensions westward. The most important and persistent of all the beds is the so-called Grey Bed. It should be noted that all the beds are decidedly irregular in character, thickening and thinning out, becoming rich in places and in others so poor as to be unworkable. Owing to these barren zones, to the rather extensive faulting that the beds have undergone, and the intersection of the general level of the plateau, under which they lie, by numerous river valleys, the entire ore field is cut up into a number of separate areas or basins.

Mineralogically the ore is a poor brown hæmatite, the impurities being, in most cases, silicious, although some beds—the aforesaid Grey Bed in particular—are calcareous, this fact contributing largely to their value. Chemically the ores contain 25 to 35 per cent. of iron and so much phosphorus as to produce a pig iron with about 1·5 per cent. of that element.

The literature of the subject is most voluminous: good descriptions of the French and the German ore-fields are both found in the "Iron Ore Resources of the World," published at the 1910 Stockholm International Congress; the French have been fully described by P. Nicou, and the German in a number of papers between 1898 and 1911, by W. Kohlmann. English readers will find a short but clear description in Prof. Truscott's translation of the work on Ore Deposits by Beyschleg, Vogt and Krusch.

The minette deposits extend northwards into Luxembourg, they barely enter Belgium and extend southwards into German territory in the annexed portion of Lorraine, partly into the adjoining portions of France. Probably the most reliable estimate of the areas of the respective portions and their ore contents is to be found in the paper by Dr. Kohlmann published in *Stahl und Eisen*, 1911, Nos. 11, 12, and 14. His figures are as follows:—

	Area of workable minette, hectares	Estimated ore reserves, tons
France	40—50,000	3,100,000,000
German Lorraine ...	27—28,000	1,841,000,000
Luxembourg (about)	2,500	250,000,000
Total	70—80,000	5,191,000,000

A brief study of the history of these deposits makes the present position intelligible. It must not be forgotten that such ores possessed practically negligible value until Messrs. Gilchrist and Thomas invented the basic process of steel manufacture: it is quite certain that had it not been for this process, the minette deposits would never have assumed their present importance, and it is equally certain that but for this process Germany would never have been in a position to commence the present war. This great invention was not made until 1878, whereas Bismarck decided how much of Lorraine he would annex in 1871: had these dates been reversed it is also practically certain that the whole of Lorraine would have been taken by Germany. The ore deposits were known certainly before 1860 and were being worked at their outcrops about that time. In 1873, when working in the annexed portion of Lorraine began under German domination, the output was only 809,541 tons. Twenty years later this had risen to 10,683,842 tons, and in 1913 to 21,135,554 tons. The rise in the French output, commencing at a later date, is even more remarkable as shown by the following table:—

	Tons		Tons
1860 ...	331,000	1900 ...	4,446,000
1870 ...	1,198,000	1905 ...	6,398,000
1880 ...	1,658,000	1910 ...	13,137,000
1890 ...	2,630,000	1913 ...	19,883,000

It will be seen that the French production was increasing more rapidly than the German production before the war, and had the same conditions continued to prevail, it would, by this time, have unquestionably overtaken it. This circumstance appears to have aroused the cupidity of the great German iron-masters, and, no doubt, caused their readiness for a war which could not possibly have been waged without their consent. A study of the German literature on the subject makes this clear enough. In the first part of the German treatise on Ore Deposits, above referred to, published in 1909, the writers express the view that this deposit will guarantee the existence of the iron industry in Germany for a very long time. Then came the sudden increase in the French production, and in 1911 already German writers tell a different tale. Dr. Kohlmann bewails the fact that the Briey ore (the most important of all the French ore basins) is richer in iron than the German ore by fully 4 per cent., and expresses the fear that the importation of French ore into Germany will increase more and more, thus displacing minette of German origin. In 1913 again *Stahl und Eisen* suggested that increasing production of the richer French ore was causing large areas of the poorer German ores to be

left unworked. As everyone knows, the first act of German aggression against France was to occupy these French iron ore fields, and ever since this occupation German writers have been proclaiming the intention of Germany to annex them permanently. On May 20, 1915, a Memorandum was submitted to the German Chancellor by a number of important technical and agricultural Societies demanding the retention of this territory because "the security of the German Empire in a future war imperatively requires the possession of all the mines of Minette." Here it may be remarked that whilst the industrial societies are anxious to secure this source of iron ore, the agriculturists are no less anxious to obtain possession of the phosphorus that the ore contains. The yearly ore output of French Lorraine represents something like 400,000 tons of phosphoric acid, and this is an asset of no mean value. Over and over again do we find these same demands recurring in the German press and in German speeches. In February, 1917, a paper on this subject was published by Dr. M. Schlenker, Syndic of the Saarbrücken Chamber of Commerce, who maintains that what France and Germany are fighting for is the possession of the Briey ore basin, and quotes Prof. Max Krohmann who speaks of the war as the "coal and iron war in Europe." The writer states definitely that unless Germany had taken possession of the Briey ore basin at the very commencement of the war, it would have been impossible for the German iron industry to have covered the requirements of munitions of Germany and her allies. Seeing that Germany raised about 8½ million tons of iron ore from the Briey basin in 1916, this statement of Dr. Schlenker's is probably no exaggeration. He again wants to retain this ore basin in order to maintain Germany's military power, because he holds "that a country which commands unlimited quantities of iron ore and coal remains simply invulnerable in its most important sources of strength and power." In October, 1917, a Leipzig Pan-German paper, after pointing out that the iron ore output of annexed Lorraine represents three-fourths of the total German output, goes on to say that "if Germany keeps the mines of France and of Lorraine, she would have available fifty million tons of iron ore yearly. She would then possess the monopoly of iron ore in Europe. . . ." Finally, at the meeting of the Union of German Iron and Steel Manufacturers in Berlin in December last, the naked truth at last came out: reports were presented to the meeting showing that the German iron ore mines could only last another 40 to 50 years, and accordingly the iron and steel industry demanded that the iron ore basins of Briey and Longwy be retained in order to supplement the existing supplies. This report was followed by a paper by Prof. Krusch to exactly the same effect: he showed that the deposits of German Lorraine would only last for another 45 years, and actually had the audacity to attempt a demonstration that France could surrender these iron ore fields without injury to her own industry!

Shortly before this meeting a petition was presented to the German Government by the two leading German associations of iron and steel makers insisting on the annexation of the French ore fields. The same arguments are repeated: it is stated that if at the outset of the war France had been able to occupy the annexed portion of Lorraine, Germany and Austria would certainly have been compelled to surrender, whilst, on the other hand, the Germans have been able to manufacture the whole of their artillery munitions out of ore extracted from the French ore fields now occupied by Germany. The petition concludes with the significant statement that "the possession of Briey and Longwy would prove of incalculable value in the case of a future war."

Nothing more need be said: it is surely obvious that the war was undertaken by Germany with spoliation as one of its main objects, and with every intention of preparing forthwith for further wars of a similar nature. It is not clear whether the plutocratic iron-masters used the military party as a tool or *vice versa*, or whether the Emperor William was their dupe, or whether he cunningly used both in order to advance his own scheme of world-domination: if it be true, as is often rumoured, that his interest in the great German iron-works is not purely platonic, the motives underlying his actions would be quite intelligible. It can only be hoped that one day the German nation will awake to the fact that they are being driven to slaughter in their millions in order that a group of immensely wealthy capitalists may yet further enrich themselves out of the spoils robbed from a neighbouring State. It is clear that what Germany means by rectification of her frontier is the annexation of the French iron ore fields, and it is also clear that she will never willingly restore Lorraine to France, not that she attaches any value to the province as such, but that she does not propose to relinquish her grasp of the iron ores contained therein. The land she might give back, but the iron ore never—if she can help it!

TUNGSTEN WITHIN THE EMPIRE.*

SYDNEY J. JOHNSTONE
(Scientific and Technical Department, Imperial Institute).

AUSTRALASIA, MALAYA, SOUTH AFRICA, CANADA.

Australia.—As an Empire producer, Queensland ranks second to British India. This State has exported wolfram since 1894, the total quantity raised to the end of 1917 being 10,114 tons, valued at £963,148. The largest production in any single year was made in 1904, when 1538 tons of ore, valued at £161,365, was obtained. Small quantities of scheelite have also been produced since 1904, but the total quantity raised to the end of 1917 was only 31 tons. According to statistics published in the Annual Reports of the Under Secretary for Mines, the production of high-grade tungsten ore during 1913 and 1917 has been as follows:—

Mineral field or district	1913		1917	
	Quantity	Value	Quantity	Value
	Tons	£	Tons	£
Chillagoe	103	9,931	126	20,574
Herberton	232	22,961	210	35,421
Ravenswood ...	8½	840	—	—
Star River	2¼	223	4½	773
Kangaroo Hills ...	12½	1,364	14	2,153
Clermont, Bowen, Gladstone, Stanthorp, Etheridge, etc. ..	½	48	8¼	1,150
	358¾	35,367	362¾	60,071

The above figures include the following amounts of scheelite: 2 cwt. from Etheridge in 1913, 1 ton from Chillagoe and 9 tons from Herberton in 1917.

In addition to the above quantities of ore mixed bismuth and wolfram ore is also produced, the output in 1917 being 131¼ tons, valued at £21,172.

Tungsten ores have been found in a large number of localities in Queensland and many of the occurrences have had a fair amount of development work done on them. The production since 1915 has been greatly stimulated by the Imperial Government's purchase scheme for these ores, great activity

* Based on a lecture entitled "The Rarer Key Minerals," delivered at the London School of Economics, Nov., 1917, and in continuation of an article which appeared in this Journal, 1918, 294 R.

being shown in the Herberton and Chillagoe mineral fields. The wolfram bearing country in these two fields has been estimated to cover a very considerable area. During 1917, the chief producing centre was Wolfram, where the ore occurs in quartz lodes traversing granitic rocks. The average content of tungstic oxide in the ore as mined was about 2·3 per cent. In many tungsten mines of this district, ores of bismuth and molybdenum also occur in payable quantities. Recently, it was announced that the more important deposits in the Wolfram district had been purchased by the Thermo Electric Reduction Co., of Luton, a British company which claims to be the largest maker of metallic tungsten in the world. Concentrating machinery and an electric power station are stated to be in course of erection for the treatment of the ore. This scheme should prove of immense importance to the locality which has suffered somewhat during recent years from lack of capital for development. It has been stated that the company hopes to raise the output of tungsten ore from the Wolfram district to 1000 tons per annum.

The district around Mount Carbine comes next to Wolfram in importance as a producer of tungsten ore. The four principal lodes worked have a width of 3 to 4 ft. each of payable material, but the production is largely dependent upon the quantity of water available, which varies considerably from year to year. At Bamford, during 1915, the principal output was obtained from a " pipe " which also yielded bismuth and molybdenum ores. A promising deposit has been opened up recently at Emuford.

Both wolfram and scheelite are exported from New South Wales. From 1903 to the end of 1916, the quantity of high grade wolfram ore exported was about 1856 tons, valued at the mines at £196,186. The chief centre of wolfram mining in New South Wales is the Torrington division, where in 1916 one of the largest mines treated 13,725 tons of ore and obtained 62 tons of wolfram concentrates, valued at £9968. The wolfram is almost invariably associated with ores of bismuth and tin. Wolfram is also produced in the Frogmore division, and small yields have been obtained in certain other divisions, *e.g.*, Tenterfield, Glen Innes, Burrowa, Yalgogrin, Emmaville, and Deepwater.

Scheelite is almost as important as wolfram from the point of view of New South Wales tungsten ore production, the ore exported from 1903 to 1916 being 1345 tons valued, at the mines, at £128,880. The greater proportion of the ore raised is obtained from the Hillgrove division, where scheelite mining began in 1898-9. The scheelite belt of this district has been proved over an area of about 8 square miles, but the actual mineralised belt is patchy, the ore occurring in a fissure lode formation which varies in width from 1½ to 6 inches. For this reason the mining is largely in the hands of individual miners. According to J. E. Carne, of the New South Wales Geological Survey, there is no reason to doubt the persistence of these deposits in depth.

In Victoria there is a small irregular output of tungsten ore from the Mount Murphy mines at Benambra.

Small quantities of wolfram and scheelite have been produced recently from the Murchison and Yaigoo goldfields of Western Australia. The total output of tungsten ores from this State to the end of 1916 was about 25 tons, valued at £2148.

In South Australia a deposit of wolfram was worked near Yankalilla as far back as 1893. A promising deposit of ferberite (iron tungstate) was opened up in 1916 at Callawonga Creek, 18 miles from Normanville, and a small quantity of high grade ore was produced.

There has been a small output of wolfram ore in the Northern Territory for some years past. In 1916 information was published concerning a very promising occurrence at Hatches Creek, about 800 miles S.S.E. of Darwin and 700 miles N.N.E. of Oodnadatta. According to a recent report of the Director of Mines the wolfram occurs in numerous well defined veins which vary in width from 1 inch up to 4 feet. The ore-bearing district covers an area of 8 square miles, but payable wolfram veins have not yet been located over the whole area. In spite of the somewhat inaccessible position of the deposits a number of prospectors are at work, but it is stated that improved transport facilities and more capital are essential for the successful working of the deposits.

There has been a small but continuous output of wolfram from Tasmania since 1903. During 1917, the output of concentrates was 169 tons, valued at £27,593; this quantity was double the production of 1916, and the largest yet recorded for the State. In addition, 59 tons of scheelite, valued at £10,452, was produced. In the Avoca district, which yielded over half of the Tasmanian output in 1915, the deposits occur at the Storey's Creek Tin mine, and according to a recent report of the Tasmanian Geological Survey the occurrence is most important and is capable of a greatly increased output. A plant was in course of erection in 1916 for treating the accumulated material, previously rejected, and it was estimated that an output of 4 tons of 70 per cent. wolfram per week would be obtained. At the Shepherd and Murphy mines of the Middlesex district, which have been operated for many years past, four lodes are now being worked and considerable development work has been undertaken. Tin, wolfram, and bismuth concentrates are being produced.

The quantity, value, and first destination of the tungsten ores raised in and shipped from the Australian Commonwealth during 1913 and 1914-15 are shown in the following table:—

Wolfram.

Destination	1913		1914 to June, 1915	
	Quantity	Value	Quantity	Value
	Tons	£	Tons	£
United Kingdom	123	13,026	250·5	25,094
France	92	10,483	163·7	16,354
Belgium	45·5	580	—	—
Germany	536·6	56,701	70·5	7,245
United States ...	—	—	—	—
Total	797·1	80,790	484·7	48,693
Scheelite.				
United Kingdom	—	—	1·5	189
France	14·4	1,500	29·4	2,900
Belgium	6 1	600	—	—
Germany	23·4	2,357	—	—
Total	43·9	4,457	30·9	3,089

In the years 1911, 1912, and 1913, only about 16·2, 17·3, and 14·6 per cent. respectively of the tungsten ore exported from the Commonwealth came direct to the U.K., whilst the quantity sent to Germany in those years was 72·1, 62·8, and 66·6 per cent. respectively. The most recent statistics for exported ore cover the period June, 1916, to June, 1917. They are:—Wolfram, 982½ tons (£181,048); scheelite, 85⅕ tons (£15,883). All the ore was shipped to the United Kingdom.

New Zealand.—This Dominion takes about third place as a tungsten ore producer of the British Empire. Practically the whole of the ore so far produced has been scheelite, which occurs chiefly in Central Otago and the Wakamarina Valley of South Island. The first attempt to mine this mineral, it is stated, was made in 1875 at the Glenorchy mine, situated on the northern side of Lake Wakatipu, 240 miles N.W. of Dunedin. Owing to

the low price of scheelite, the venture failed and the mine was closed down until 1905 when it was successfully re-opened. The other important scheelite mine in Otago province is the Golden Point at Macrae's Flat, 50 miles north of Dunedin. The scheelite in this district occurs as a bedded deposit in quartz, and its gold content is of greater importance than the tungsten. Gold is frequently found in the scheelite deposits of New Zealand.

The total production from 1899 to 1916 amounted to 1833 tons of scheelite, valued at £201,550. The requisitioning of supplies of tungsten ore by the Imperial Government at a fixed price in 1915 gave considerable impetus to the industry, and the number of companies, etc., operating increased from 5 to 40.

Federated Malay States.—According to a report by the Senior Warden of Mines, tungsten ores do not usually occur here in well defined deposits, the ores being found mixed irregularly with tin ore and gangue. Although much has been done to stimulate production, this fact renders any large increase unlikely in the immediate future. Tungsten ore amounting to 407 tons was imported in 1915 for treatment at concentrating plant, and then re-exported: hence the total exports of tungsten ore for that year exceed the production.

Production of Tungsten Ore Concentrates (after correction for inter-State trade).

	1916	1917
Perak	217 tons ...	408 tons
Selangor	228 ,, ...	274 ,,
Negri Sembilan ...	67 ,, ...	25 ,,
Pahang...	3 ,, ...	1 ,,
Total ...	515 ,,	708 ,,

Straits Settlements.—Treatment plants are here also in operation and ore from Burma and the Malay States (British and Siamese) has been concentrated. In 1913 practically 90 per cent. of the treated ore re-exported went to Germany.

The output in 1915 was equivalent to 334 metric tons of 60 per cent. ore, containing about 80 per cent. wolframite. The chief producer was the Tati mine.

Unfederated Malay States.—Small quantities of wolfram ore have been obtained from the States of Trengannu, Kedah and Johore, the first named being the largest producer.

Union of South Africa.—So far, nothing approaching a regular output of tungsten ore has been attained in South Africa, but the Imperial Government has recently taken steps to encourage production. The value of the ore mined in 1916 was £252, in 1917 £1551, and from January to June, 1918, £880, the majority of the ore being raised in the Transvaal at the Stavoren tin mines.

In Cape Province, wolfram occurs with tin ore at Kuils River. Scheelite is of more frequent occurrence than wolfram, and has been found in the tin districts of Rooiberg, Oshoek and Swaziland.

In South West Africa at Nakais, a new wolfram mine was opened up in 1915, but no production has been recorded.

Rhodesia.—Wolframite deposits were located in 1906 at Essexvale in Southern Rhodesia and during 1907 and 1908 85 tons of concentrate, valued at £7165, was produced, but the output ceased in 1909. Interest was again taken in the deposit in 1916 and a large quantity of the rubble was sampled, but the grade was stated to be too low to render the treatment adopted a commercial success. During 1917 11¾ tons, value £2070, was marketed. The ore in the rubble is chiefly wolframite, but scheelite also occurs. The work so far has been on the alluvial matter, which gave a recovery of 2 to 8 lb. of wolfram per ton of rubble. The tungsten minerals also occur in reefs of greisen, but little has been done to prove the value of the occurrence.

Canada.—Tungsten ores have been known to occur for many years past in Nova Scotia, Quebec, Ontario, British Columbia, and Yukon Territory, whilst more recently scheelite has been found in Manitoba. So far, however, only a very small quantity of concentrates has been produced. Several occurrences have been exploited on a small scale, but considerable work remains to be done in order to prove the commercial possibilities of many of the reported occurrences.

Until quite recently, the only recorded production of tungsten ore in Canada had been obtained from the Scheelite Mines in the Moose River district of Halifax county, Nova Scotia. This property is situated two miles west of Moose River gold mines and is connected, by 18 miles of good road, with the railway at Middle Musquodoboit. The deposits were discovered about 1908 and during 1912 15 tons of scheelite concentrates carrying 72 per cent. of tungstic oxide were sold. During 1913 about 10 tons of concentrates were produced but the mines appear to have remained idle from that date until July, 1916, when work was restarted.

The scheelite is associated with quartz, mispickel, mica, felspar, etc., and occurs in veins similar to those of the neighbouring gold-bearing region. The mineral itself is found in disconnected lenses 2 to 6 in. in width and varying from 6 in. to 2 ft. in length. The quantity of scheelite in the veins is very variable, but it has been estimated that by careful sorting one ton of ore carrying 10 per cent. of scheelite can be obtained from each 25 tons of rock mined. In 1916, the main vein had been traced underground and proved to carry scheelite over a length of 950 ft. The mine is equipped with the requisite plant for the concentration and magnetic separation of the ore.

Wolframite has also been found in Nova Scotia, as an outcrop, about 20 miles above Boiestown on the Miramichi river. Mining and concentration of the ore were started in 1916 on a small scale, but the development of the deposit is hindered by the lack of adequate transport facilities.

In New Brunswick, a promising deposit of wolframite occurs in York county at the Burnt Hill mine situated on Southwest Miramichi river. The wolframite, which is associated with molybdenite, arsenopyrite and pyrrhottite, occurs in quartz veins outcropping on the slope of a valley 170 ft. above the river. The ore on the exposed portion of the vein carries from 2 to 6 per cent. of wolframite. Mining has been in operation for about a year, and small parcels of concentrate have been produced.

In Yukon Territory, scheelite was found, in 1916, in gravels and lodes along Dublin Gulch in the Mayo area of the Duncan Creek mining district, a locality somewhat difficult of access. It is anticipated that a small yield of concentrates will be obtainable from this source in 1918.

In the Falcon Lake district of Manitoba, scheelite was found, in 1916, by prospectors searching for molybdenite. Promising results have been obtained on the only deposit examined. The ore which occurs in a zone 3 to 5 ft. wide associated with epidote, carries from 5 to 15 per cent. of scheelite.

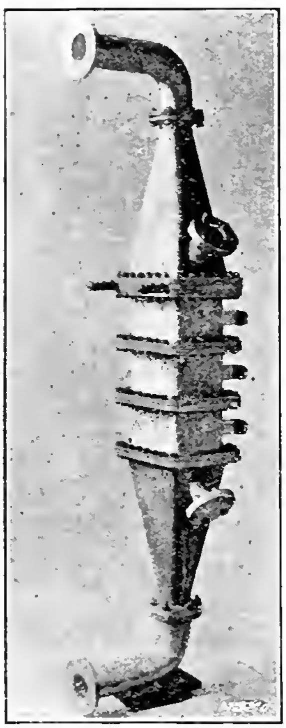
A fairly extensive survey of the tungsten resources of the British Empire leaves no doubt as to their importance. In Burma we possess a field second to none in the world; Queensland, Federated Malay States, New Zealand, and New South Wales rank next in order of importance, and the deposits in Tasmania, Rhodesia, Union of S. Africa, and Canada give promise of increased outputs in the future.

THE OXIDATION OF AMMONIA.

J. R. PARTINGTON.

The present communication is based upon a lecture which was given on four occasions at the British Scientific Products Exhibition, held at King's College, London, during the period August 12—September 7, 1918, by the members of the staff of the Nitrates Section of the Munitions Inventions Department Research Laboratory. A demonstration of an ammonia oxidation apparatus in operation was given at each lecture.

The vital importance of providing a national supply of combined nitrogen for munitions and agricultural purposes requires no elaboration in this Journal. Something has been heard of the successful exploitation of nitrogen fixation processes in Germany since the war began, but of the progress made in the allied countries, little information has been published. In England, the Munitions Inventions Department of the Ministry of Munitions has been actively engaged in research connected with this problem and its efforts have met with a large measure of success.



One of the first problems investigated was the oxidation of ammonia with atmospheric oxygen, a reaction which has long been known to occur when ammonia gas and air are passed over a heated catalyst, such as platinum. The plant required for carrying this into effect is very simple in principle.

One form of technical converter unit is shown in the illustration. It consists of a top and bottom cone, with three rectangular body pieces between them, all in cast aluminium $\frac{1}{5}$ in thick, the rectangular area exposed measuring 4 in. by 6 in. The pieces are provided with flanges, $\frac{3}{4}$ in. wide, to facilitate bolting together, and three perforated baffles are inserted in all the junctions except that between the top cone and the top segment of the body, which is occupied by the catalyst frame. Though each cone possesses a sight orifice, $1\frac{1}{2}$ ins. in diameter, for reasons of standardisation, that in the top cone alone is used, and is provided with a mica window for inspection of the catalyst. Aluminium bends of 2 ins. internal bore provide inlets and outlets for the mixture of air and ammonia at the bottom, and the oxides of nitrogen at the top, respectively. The overall length of the converter is about 4 ft. and its weight is about 32 lb.

The air supply is obtained from a blower, and it is essential that the air and ammonia should be well mixed. If ammonia gas is used, it may be injected into the air stream through a nozzle, after both gases have been measured. In technical practice it is more convenient to use purified ammonia liquor containing 25 per cent. of ammonia, which is now a commercial article. The air is passed, together with a small amount of steam, into the base of a coke tower down which this liquor flows. The mixed gases are cooled in the upper portion of the tower, where the steam is condensed. The mixture of air and ammonia should be filtered, either by passage through a length of coke packing in the upper portion of the tower or through a filter packed with glass wool, which removes particles of dust. Oxide of iron particularly must be eliminated, as this has a deleterious effect on the platinum catalyst.

The most important part of the apparatus is the catalyst, which is fixed between the upper cone and body segment. It consists of one or more gauzes made of pure platinum wire, stretched across the converter at right angles to the gas flow. The wire used is 0·0025 in. diameter, and is woven into gauze with 80 meshes to the inch. The gauzes are mounted in an aluminium frame. The reaction occurs during the very small interval of time in which the gases are in contact with the catalyst, and is represented by the equation :—

$$4NH_3+5O_2=4NO+6H_2O+220 \text{ kg. cal.}$$

The operation of the catalyst must be initiated by heating the gauze, either by means of a non-luminous gas flame, or by heating electrically with suitable current conducted through leads attached to the opposite edges of the gauze. When the first method is used an orifice is provided in the upper body segment just below the gauze, which admits of the introduction of the flame, and is closed when the converter is in operation. The converter figured is provided with leads for electric current. When the reaction begins, the gauze is maintained at a red heat by the heat of oxidation, and the conversion proceeds uninterruptedly as long as the supply of air and ammonia is maintained. The platinum gauze may be used for about three months, after which it is desirable to replace it by a new gauze and to clean and refit. New gauzes are not very active at first, but acquire their full catalytic activity after a few hours' running.

The proportion of ammonia oxidised to nitric oxide is of primary importance from an economic point of view, and the conditions enabling the best yield to be obtained have received a great deal of study. The yield is influenced by a variety of circumstances.

Firstly, it is found that the addition of one or more gauzes to the first one, placed in close proximity to it, has a beneficial influence. In the electrically heated type of apparatus the catalyst consists of two superimposed gauzes, insulated from each other, the lower one of which is provided with leads for electric current. When no electrical heating is used, two or more gauzes can be placed close together to form a composite catalyst in the manner described by Kaiser in 1910. As an illustration of the effect of using more than one gauze, it may be stated that, if a single gauze is used and no heat is supplied beyond that generated in the chemical reaction, then 90 per cent. of the

ammonia is recoverable as oxides of nitrogen with a flow rate not exceeding the production of 0·25 ton HNO_3 per sq. ft. of catalytic area per 24 hours. With two gauzes, under the same conditions, this may be raised to 0·35 ton with the same efficiency, or to 1·5 tons with an efficiency of 85 per cent. With four gauzes the production attains 2 tons HNO_3 with an efficiency of about 85 per cent.

Secondly, although these figures show that there is a decrease of efficiency when the flow rate is increased, with a converter working without any source of heating beyond that supplied by the reaction, yet it has been found that the efficiency may be maintained at high flow rates by the application of additional heat. This heat is supplied either by electrical heating of the gauze, or by heating the mixture of air and ammonia, or the air alone, to about 350° C. before it reaches the converter.

Thirdly, although the efficiency depends somewhat on the proportion of air and ammonia, yet this can be varied within certain limits without affecting the yield. These limits extend from the proportion requisite to produce N_2O_3 and that leading to the production of N_2O_5. The best proportion appears to be in the neighbourhood of the mixture for N_2O_3, when the gauze has a temperature of 650°—700°. If too rich a mixture is used the gauze becomes too hot, and decomposition into elementary nitrogen results. If too poor a mixture is used, the gauze is too cool, some ammonia passes through unoxidised, and loss again occurs. Within the limits referred to the yield is only slightly influenced by the temperature.*

Under established conditions, an output of 1·5 tons of nitric acid (HNO_3) per square foot of catalyst area per 24 hours, with an efficiency of 95 per cent., has regularly been attained. Without the application of external sources of heat, the efficiency, as mentioned, is of the order of 85 per cent. The output of a converter may, however, be reduced to 25 per cent. of the maximum rate without affecting the efficiency.

The platinum gauze employed weighs about 50 grams per sq. ft. and the output of nitric acid per 24 hours per gram of platinum when two gauzes are used thus amounts to 15 kgm. The output of these converters, whether it be referred to their size or to the weight of platinum used, therefore far exceeds that attained in other types.

The hot gases, leaving the converter at about 400°—600° C., may now pass to a cooler, made of acid resisting material, where their temperature is reduced to about 30° C. Additional air may then be added to enable the nitric oxide to pass into nitrogen dioxide (NO_2). The steam produced in the reaction in the converter is also condensed, and when the cooler is very efficient the water formed should carry down only a small fraction of the oxides of nitrogen.

The conversion of ammonia to oxides of nitrogen is a matter of no great difficulty once the conditions are understood. The utilisation of these oxides of nitrogen is, however, an intricate problem, the solution of which depends of course on the final product which is desired. A considerable amount of research has been devoted to this side of the problem.

There is, however, one interesting manner in which the oxides can be utilised directly, and this consists in admitting them to the lead chambers of a sulphuric acid installation as a substitute for the oxides of nitrogen obtained by "potting" nitre. The import of this salt, which amounted before the war to 18,000 tons per annum for this purpose, is thus economised.

* On the influence of temperature and composition on the yield, compare Partington, "The Alkali Industry" (1918).

The ammonia oxidation process has already been adopted by several of the large sulphuric works in England, and undoubtedly has a very extensive future before it in this direction. There is a considerable saving of expense in the replacement of nitre by ammonia oxidation, in addition to the much more regular working of the process. A detailed scheme of standardisation of plant has been arranged by a Committee on which the Ministry of Munitions and manufacturers are represented, and an efficient form of apparatus devised, including the plant for generating ammonia gas from ammonia liquor.

By reason of the high productive capacity of the new converters, a unit of only 2 in. by 3 in. cross-section, which was shown in operation at the exhibition, is capable of supplying oxides of nitrogen to a chamber plant of moderate capacity, and has been used for that purpose. The standardised design has a cross-section of 4 in. by 6 in. and will supply an efficient chamber plant making 80 tons of acid per day.

If the oxides of nitrogen are not utilised directly they may be converted into nitric acid by absorption in water. This necessitates a system of absorption towers such as is used in the arc process. Since, however, the gas from the ammonia oxidation contains about 10 per cent. by volume of oxides of nitrogen as compared with 1 per cent. in the gas from the arc, the size of the tower system can be reduced, but even so the cost of the towers alone comprises about half the cost of a complete installation for making dilute nitric acid of about 50 per cent. strength from ammonia.

When this dilute acid is obtained it may be neutralised with a further quantity of ammonia to produce ammonium nitrate, or by soda or limestone to produce fertilising materials.

Many other ways of utilising the oxides of nitrogen are being investigated, so that the British nitrogen industry may be in a favourable position to fight that of Germany in the time of keen competition which is coming. Ammonia oxidation plants are also in operation in the United States, in France, Italy, and Russia. This country does not yet possess a national synthetic nitrogen works, and in this respect it compares unfavourably with several other countries. The importance of this new industry may be gauged from the recent statement of Mr. Secretary Daniels, of the United States Government, that he considers the nitrate situation as one of the most important and critical of the whole war, and that his Government has allocated no less than £20,000,000 for the erection of five large works for the production of nitric acid by the oxidation of ammonia.

PLATINUM AND ALLIED METALS IN 1917.*

According to Prof. J. L. Howe of Washington and Lee University the estimated total production of crude platinum in the world to January, 1917, was, in troy ounces:

	Minimum	Maximum
Russia	7,115,482	10,128,308
Colombia	700,000	735,000
Borneo	175,000	200,000
New South Wales and Tasmania	9,000	10,000
Canada	9,000	10,000
United States	10,000	12,000
	8,018,482	11,095,308

* By J. M. Hill, United States Geological Survey, June, 1918.

The total supply of platinum metals in the world is probably more than 10,000,000 ounces, of which about 1,000,000 ounces of platinum and 400,000 ounces of other metals of the platinum group are now in the United States.

The shortage of platinum in the United States was considerably relieved by the receipt, late in 1917, of about 21,000 ounces from Russia; this was immediately commandeered by the Government.

Crude platinum was produced in Alaska, California, Oregon, and Washington in 1917, and 31,921 ounces of foreign crude platinum was refined, apart from that received from Russia in December. Most of this platinum came from Colombia; the rest mainly from British Columbia, Java, and Russia. In the same year, 38,831 troy ounces of refined new metals of the platinum group was recovered from alloy with other metals, and of this quantity 7384 ounces is believed to be of U.S. production. Also, in 1917, 72,186 ounces of secondary platinum metals was recovered from refining scrap and sweepings.

The following table shows the world production of platinum in recent years, in troy ounces:

Country	1912	1913	1914	1915	1916	1917
Borneo and Sumatra	—	200	(*a*)	(*a*)	(*a*)	(*a*)
Canada ...	30	50	30	100	60	80
Colombia ...	12,000	15,000	17,500	18,000	25,000	32,000
New South Wales and Tasmania	778	1,500	1,248	303	222	(*a*)
Russia ...	300,000	250,000	241,200	124,000	63,900	50,000(*b*)
United States	721	483	570	712	750	605
Total ...	313,529	267,233	260,548	143,145	89,932	82,685

(*a*) No basis for estimate.

(*b*) Some estimates place this figure as high as 100,000 ounces.

The imports of platinum and allied metals into the United States in 1917, excluding those received from Russia in December, were about 57 per cent. of those in 1916 and 25 per cent. of pre-war imports. The average market price in New York for refined platinum for the year 1917 was \$102·80 (=£21 2*s*. (*d*.) per troy ounce. Refined palladium rose from \$70 (=£14 7*s*. 8½*d*.) per troy ounce at the beginning of 1917 to \$135 (=£27 14*s*. 10*d*.) in December.

Average price per troy ounce of refined metals of platinum group, 1914–1917.

Metal	1914	1915	1916	1917
Platinum	185/-	226/-	345/-	423/-
Iridium	267/-	341/-	386/-	617/-
Iridosmine (iridio-osmium)	136/-	144/-	185/-	329/-
Palladium	181/-	230/-	275/-	452/-

In 1917 the price of crude platinum in the United States averaged 370/- per troy ounce.

During 1917, 81 ounces of platinum was saved at the Alaska mines, and about 460 ounces from California was sold to refiners in the same year. From Nevada 442·53 tons of copper-gold-platinum ore was shipped yielding 107 ounces of platinum and 400 ounces of palladium. Oregon yielded over 65 ounces, Washington several ounces, and Wyoming 350 tons of concentrates containing much palladium and about a third as much platinum.

The Tulameen district in British Columbia produced from 75 to 90 ounces of platinum in 1917, and from Colombia the United States imported 31,737 ounces of the crude metal.

Little platinum can be expected from Russia for some time; none of the dredges is working, and that which is now produced is won by hand methods.

LECTURES AT THE BRITISH SCIENTIFIC PRODUCTS EXHIBITION.

DECAY AND RENASCENCE OF BRITISH DYE-MAKING.

The above was the title of the lecture delivered by Dr. M. O. Forster on August 26. Prof. G. T. Morgan presided.

After pointing out the interdependence of synthetic colour manufacture and the production of illuminating gas, heavy chemicals and high explosives, the lecturer proceeded to discuss the British dye industry since its inception in the middle of the last century. The period between 1856 and 1870 was one of great activity and considerable prosperity among British colour makers, namely Simpson, Maule, and Nicholson, Read Holliday and Sons, Perkin and Sons, and Roberts Dale and Co., who were busily occupied in manufacturing violets, greens and blues belonging to the class known to chemists as "basic colours." Their principal competitors were the French manufacturers, but after the Franco-German war the German factories rapidly took the lead, and the period 1870-80 must be recognised as that in which British dye-making was definitely overtaken by the German industry.

One of the causes of this change arose out of the war. A liberal Government subsidy granted to the German universities out of the large indemnity extorted from the defeated French nation soon produced an army of well-trained young German chemists, who were quickly absorbed by the chemical factories. These were joined also by several older chemists who, disappointed with the discouraging outlook for chemistry in England, left the English colour factories in which they had been working and returned to their own country in search of more agreeable conditions. Moreover, Professor Hofmann, under whom W. H. Perkin, senior, was trained, had already left this country in 1865, and as the head of the chemical department in Berlin University was largely instrumental in building up the German school of organic chemistry.

Already in 1875 the Badische Anilin und Soda Fabrik employed more workmen than were occupied in the largest British colour-making factory in 1914. It is estimated that in 1878 the total production of artificial colours was valued at £3,150,000, of which Switzerland and France each produced £350,000, England £450,000, and Germany £2,000,000 worth, of which four-fifths were exported. Thus already, forty years ago, the German industry was four times as powerful and highly developed as the corresponding effort in this country, and moreover the German expansion of artificial colour manufacture has progressed vigorously throughout the intervening period, so that it is absurd to expect the recovery by this country of a position of equality in a matter of two or three years. It is much more likely that ten or fifteen years will be required, and only then if the same principles of patient inquiry into scientific principles, liberal expenditure on chemistry and chemists, thoughtful attention to the requirements of customers, and strict self-control in the distribution of profits are followed out consistently.

Throughout the war encouragement has been given to the popular heresy that Germany stole the synthetic colour industry from this country. Within the last few weeks the following ridiculous assertion was made in a public newspaper: "The Germans stole all their science from British brains, from Darwin's theory of evolution to the manufacture of aniline dyes. The German chemists have no doubt improved the original processes of aniline dye-manufacture, but they deserve no credit for

that—it is the least they might be expected to contribute to science." It is rubbish of this character which by flattering the national vanity militates in this country against the development of scientific thought and scientific method. The discovery of artificial colours, originating it is true in this country, was a pure accident. Perkin hoped to produce quinine when he discovered mauve, and although it does not diminish the credit due to him to make this admission, it cannot be pretended that the discovery of either mauve or magenta was the result of British or French foresight. On the other hand, the establishment of synthetic indigo manufacture on a commercial basis was the outcome of close and systematic study by a large number of German chemists who were subsidised by a company sufficiently courageous to spend money in this manner rather than to distribute it as dividends to greedy shareholders. It is only by following these same processes of development that success can be attained in the aniline colour industry.

ALUMINIUM AND ITS ALLOYS.

Lecturing on September 4, Dr. W. Rosenhain, of the National Physical Laboratory, dealt with possible future applications of aluminium alloys. Such alloys, he said, could only be of use for structural purposes if they combined lightness with high strength. An alloy of this kind taken from a Zeppelin brought down in this country was found to possess a tensile strength of 25 tons to the square inch as against 28—30 for mild steel; but it was inferior to material made lately in this country. The limiting length of a vertically suspended bar of structural steel, which would just bear its own weight, was about 19,000 ft., of pure aluminium 14,000 ft., and of aluminium alloy 50,000 ft. The limiting span of a steel bridge was 2000 to 5000 ft., but that of an aluminium alloy bridge would be three times as much. In the future, such light alloys might find extensive application in bridge construction. Another field of utility was in the construction of objects which had to be started and stopped, *e.g.*, sewing machines, bicycles, artificial limbs, road and rail vehicles, etc. When a heavy machine or vehicle is started or stopped, much waste of energy takes place (in the case of an electric train 3000 amps. at 500 volts is required to overcome the inertia in starting), and this loss would be much reduced by the use of a lighter material. The unpopularity of aluminium and its alloys was largely due to the extravagant claims, *e.g.* that of incorrodibility, made for them on their introduction. They do corrode, especially in contact with sea water or the rain water of towns, but like other metals they can be protected. Then again there had been difficulties in connexion with soldering and welding, but some better solders have been produced of late, and screwing, bolting and riveting were easy of accomplishment.

The disadvantages of possessing a low elastic modulus and high thermal expansion could be allowed for in design; and high thermal conductivity was as a rule an advantage. The main objection to the use of light alloys was that of cost. A pre-war average figure for aluminium was £100 per ton, as against £7 per ton for structural steel; and although 1 ton of the former would do the work of 3 tons of the latter, the advantage lay clearly with steel. Aluminium could never become as cheap as steel, because its extraction entailed a greater expenditure of energy. There was no doubt that after the war the price of aluminium could be reduced below its pre-war level. The projected provision of cheap electric power, together with the establishment of works for purifying and decomposing the ore near the mines, would help towards this end.

NEWS AND NOTES.

AUSTRALIA.

Blythe River Iron Mines.—Mr. Watt, Acting Prime Minister, has announced that the Commonwealth Government has decided to purchase for £3000 an option for twelve months over the property and rights of the Blythe River Iron Mines, Ltd., Tasmania, with a view to developing the metallic resources of Australia, and encouraging their most effective utilisation for National and Imperial benefit. If the option is exercised the total sum payable is £110,000. The deposit resembles Cumberland red hæmatite, and is estimated to contain 17,000,000—23,000,000 tons of marketable ore, suitable for producing the highest forms of iron and steel. Sir John Higgins, Honorary Metallurgical Adviser to the Commonwealth Government, was privately offered the property for flotation, but he gave the Commonwealth Government the first chance to secure it. He has generously offered to assign his commission of £10,000 to the Commonwealth Government for investment in inscribed stock, the interest to be devoted to the promotion of a study of the technology of iron ores and metallic iron and steel.

Restrictions on Trade.—Mr. Watt has also announced that owing to the shortage of foundry pig-iron and steel plates for ship-building, and the smaller sections of steel bars, etc., no further permits to export iron or steel from the Commonwealth would be permitted until local requirements were fully satisfied. The Director of Munitions was authorised to take a census.

A War Precautions Regulation was issued on August 25 providing that, except with the consent of the Minister of Customs, no goods shall be entered or removed for home consumption under any law relating to customs, distillation or excise, by any person, firm or company in quantities exceeding in any month the normal requirements of that person, firm or company.

Investigations by Prof. M. Lefroy.—A further announcement is that the Cabinet has decided to engage Prof. Maxwell Lefroy, of the Imperial College of Science and Technology, to investigate the blowfly pest, and also to report on methods for combating grain weevils, the woolly aphis in prickly pear, and the St. John's wort pest, and to investigate the possibility of establishing the silk industry in Australia. The term of his engagement is for twelve months at a salary of £3000.

CANADA.

Medicine Hat Coalfield.—Natural gas has been, and still is, the mainstay of Medicine Hat, Alberta, but much attention is now being given to the development of coal deposits in the district. Arrangements have been made with an American syndicate to develop the Ainsley Mine—a good lignite coal area located five miles from the city—on the understanding that the plant will be operating by February 1, 1919, with a capacity of 1000 tons per day.

Developments in the Kootenay District.—Work is progressing rapidly on the power line of the West Kootenay Power Company to Copper Mountains, and the construction of the Kettle Valley railway branch is also going ahead. The Canada Copper Company is progressing well with the construction of its concentrating mill, the idea being to have it ready for operation as soon as power and transportation are forthcoming. It is expected that the mill will receive from 2000 to 3000 tons of ore per day, and a ten years' supply of ore is stated to be available. This will provide

for the production of about 40 tons of copper per day in addition to the gold and silver products.

THE WORLD'S LARGEST GOLD REFINERY.—Since the outbreak of war gold coin and gold bullion to the value of 1300 million dollars have been received in Ottawa by the Department of Finance as trustees for the Imperial Government and the Bank of England. The heavy demand on the gold refinery at the Government mint led to the construction of a second plant with a monthly output of 1,000,000 oz. of fine gold, and through this extension the refinery has developed until it has now the largest capacity of any gold refinery in the world. As the war made it impossible for the Newfoundland Government to get supplies of coin from England, the coinage for that colony is now being manufactured at the Canadian mint.

SCIENTIFIC AND INDUSTRIAL RESEARCH IN CANADA.—An abstract of the Report of the Canadian Advisory Council, forwarded by H.M. Trade Commissioner at Toronto, states that Prof. A. B. Macallum, of Toronto University, has been appointed Chairman of the Council. His duties will be to increase the number of trained research men and to stimulate the public mind in regard to the importance and utility of scientific research. Research is to be assisted by the founding of studentships and fellowships, and the provision of grants.

The following investigations have been undertaken :—

Tar fog.—The problem of conserving economically the products of destructive distillation of wood and coal, and the liquid by-products of the manufacture of producer gas has been investigated, and it has been concluded that these products can be separated from steam and gas at high temperature by the Cottrell process, which is likely to be employed.

Straw gas.—Twenty million tons of straw, now wasted by open burning, is to be utilised for heat and light production.

Sulphite liquor waste.—This waste from Canadian pulp mills, now polluting rivers, contains sugars which should furnish alcohol for industrial purposes.

Rust-resisting wheat.—More than 20 million dollars (£4,110,000) is lost annually in Manitoba, Saskatchewan and Alberta through rust disease. Research for prevention has been initiated.

Associate Committees of experts have been appointed on Chemistry, Mining and Metallurgy, Forestry, Cold Storage, and Flax. The following are selections from the activities of the Chemistry Committee :—

Utilisation of fish waste.—Fish waste in Canada exceeds 300,000 tons per annum, half of which might produce nitrogenous and phosphatic fertilisers, and food for cattle, pigs, and poultry. A thorough survey of the question is being made.

Industrial alcohol from wood waste.—Besides the sugar of sulphite liquor waste from pulp mills wood waste is likely to prove a very economical source of ethyl alcohol in British Columbia where large supplies of sawdust are always available.

Utilisation of scrap leather.—Two thousand tons of scrap leather is annually wasted in Canada, and the question of its economic utilisation is being investigated.

Flax.—The Flax Committee recommends an increase in the growth of flax to provide fibre for aeroplanes. The acreage of flax in Eastern Canada may be 14,000 in 1918, as compared with 8000 last year.

Western lignites.—The Council recommends the use of Western lignites, which can be carbonised and briquetted, and then substituted for anthracite.

Research in Canada.—To promote industrial research throughout the Dominion, Trade Associations or Guilds of related industries must be founded, in order to pool expenses and share benefits. Some of the advantages to an individual industry in the Guild would be :—

(a) The right to recommend specific problems for research, which, if approved, would be carried out without cost to the firm recommending the problem.

(b) The right to periodical information in regard to the technical development of the industry.

(c) Right to the use of patented or secret processes which might be developed from the researches.

The Guilds would be financed partly by the industries, partly by Government. Suggested groups of industries are: tanning, paint and varnish, textiles, pulp, paper, and clay products.

The founding of a Central Research Institute in Canada analogous to the Mellon Research Institute at Pittsburg is discussed. It is recognised that only by the encouragement of research can Canada compete successfully in the race for industrial prosperity.—(*Bd. of Trade J., Aug.* 15, 1918.)

SOUTH AFRICA.

INDUSTRIAL DEVELOPMENTS.—*Cape Peninsula.*—It is officially reported from Saldanha Bay that factories for fish canning, phosphate working, oyster-shell, and whaling works are now in operation in that district.

Witwatersrand.—One firm is doing a large business in the manufacture of rubber goods for the railways, municipalities, mines and other industrial undertakings. The list of goods manufactured includes washers, valves, piston rubbers, buffers, barrel rollers, etc., and in addition several motor shops are retreading motor tyres.

Natal.—Messrs. Kynoch, Ltd., of Umbogintwini, are manufacturing waterproofs for motor and tram drivers, and also oiled silks for surgical dressings.

It is anticipated that a big industry will be built up in upholsterers' and bookbinders' leathers.—(*S. Afr. J. Ind., July*, 1918.)

SOUTH AFRICAN COTTON.—In spite of the many initial difficulties and disappointments, cotton-growing in the Union continues to make satisfactory progress. Revised estimates of this season's cotton crop indicate a production of upwards of 5,000,000 lb. of seed-cotton. This will give, approximately, 1,700,000 lb. of lint. A portion of this supply is expected to be purchased locally for textile purposes, but the greater portion will go oversea.

GENERAL.

NATIONAL INDUSTRIAL COUNCIL FOR THE CHEMICAL INDUSTRY.—The first meeting of this Council, appointed under the Whitley scheme, was held in London last month. Mr. Roscoe Brunner was elected president, and Mr. E. Bevin, of the Dock, Wharf, and Workers' Union, vice-president. A letter was read from Dr. Addison suggesting that an advisory committee of the Association of British Chemical Manufacturers should deal with technical and commercial questions, upon which two Labour leaders and two members of the Chemical Employers' Federation should be co-opted. The suggestion was adopted unanimously, and Messrs. R. Brunner and G. W. Stuart were appointed to represent the employers and Messrs. T. W. Kelby and Fleming Eccles the workers.

BURMA WOLFRAM OUTPUT FOR 1917.—According to a semi-official statement, the Tavoy district of Burma, which produces 80 to 90 per cent. of the

wolfram output of the whole country, yielded 3652 tons in 1917, against 3036 tons in 1916 and 2115 tons in 1915.—(*U.S. Com. Rep., July* 18, 1918.)

New Chemical Enterprise in British India.—An important project has been launched by a French expert who is in Bombay, to manufacture on a large scale chemicals from raw materials obtained in India, and especially to develop in India the industry of wood distillation. The new company, states an Indian authority, has been permitted by the Government of India to issue its share capital up to ten lakhs during the currency of the Indian Companies Act, as the undertakings of the company are considered to be of great national importance. The company has obtained valuable concessions from the Government of Portuguese India, and has secured in the districts of Goa and Satara the exclusive rights of using fifty thousand acres of forest land for the purpose of manufacturing wood alcohol and other by-products.

The company also proposes to start factories at Vascodagama, Sanvordem, and Collem for manufacturing oil and other chemicals. A factory has already been established at Parel, Bombay, for the manufacture of tannin extracts and vegetable colours.—(*Bd. of Trade J., Aug.* 29, 1918.)

Oil of Wintergreen.—*Gaultheria fragrantissima*, Wall., grows abundantly in Assam, the Nilgiris, and on the hills near Toungoo in Burma, but no serious effort has been made to use it for the manufacture of wintergreen oil. The Forest Chemist at Dehra Dun found the yield of oil from Assam leaf, with 45·8 per cent. of moisture, to be 0·65 per cent. A rough approximation of the cost of production per lb. of oil (including collection, packing, freight, supervision and depreciation) is R. 1 As. 10. Even allowing the pre-war figure of Rs. 4 per lb., there is every reason to conclude that a prosperous industry might be carried on. At the present time there is a great scarcity of the artificial oil which is selling at Rs. 8 per lb.—(*Capital, May* 24, 1918.)

The Rumanian Graphite Deposits.—The Austrian Department of Mines has obtained from the Rumanian Government a concession for working the graphite deposits in the districts of Gorjiu and Ramnicu Valcii for a period of 75 years. These mining rights affect an area of 10,000 hectares. According to an agreement arrived at between Austria-Hungary and Germany for sharing the exploitation of Rumania's mines, the former will get five-twelfths and the latter seven-twelfths of the produce of the graphite workings. Austria occupies the first place in the world production of graphite, more than half being derived from her territory. Ceylon graphite is of much better quality than the Austrian, but the output of the island is much less than that of Austria.—(*Metall u. Erz, June* 8, 1918.)

The Iron Ores of Belgium.—The interest manifested in Germany in the iron ore wealth of contiguous lands finds further illustration in an article in *Glück Auf* on the iron-ore deposits of Belgium. The district surveyed is that known as the Campine, which comprises the northern portion of the country. The ores are of two kinds, distinguished by geological conditions of their occurrence, the old alluvial or diluvial "brown-stone" of the Pliocene formation, and the new diluvial "Rasenstein," or peat-stone, of the peat valleys of the north. Both kinds owe their origin to the weathering of the glauconite, which is the matrix of all the ores of the Campine. The brown-stone deposits are not of great importance, but the peat-stone beds are of considerable extent, and are being worked on a fairly large scale.—*Glück Auf, June* 15, 1918.)

Iron Ore in Bavaria.—The production of iron ore in Bavaria was very considerable in the middle ages, but was superseded later by Westphalian and other pig-iron. Lately the industry has been revived, and Bavaria now ranks fourth among the iron-ore producing states of Germany. According to a recent report, the output rose during the ten years 1904 to 1913 from 180,342 to 485,254 tons, of which 473,498 tons was smelted in Bavaria. The supplies of iron ore which will be available within a measurable period of time, and which are chiefly in the Upper Palatinate and Upper Franconia, are estimated at 150 to 200 million tons.—(*Iron and Coal Tr. Rev., Aug.* 9, 1918.)

Sulphur and Phosphorus in Steel.—In order to ease the difficulties experienced by steel manufacturers in America in producing material that will conform to the low maximum sulphur and phosphorus limits prescribed by the specifications of the American Society for Testing Materials, it was decided by that Society, upon recommendation of its Committee on Steel, to raise the sulphur limits on all steel and the phosphorus maximum in acid steels by 0·01 per cent. This change became effective on June 26, and is to continue for the duration of the war or until otherwise ordered by the Society. It affects some 40 steel specifications, and will release an immense tonnage of steel.—(*Iron and Coal Tr. Rev., Aug.* 9, 1918.)

Spanish Pyrites.—The province of Huelva, Spain, is the greatest producer of pyrites in the world. According to the calculations of mining experts, there still exists about 250 million tons of ore. The normal annual export is about 3 million tons, of which the United States takes 1 million; but in 1917 only 755,991 tons was shipped abroad. This quantity was produced at the following mines: Rio Tinto, Tharsis, and Esperanza (British), 614,317 tons; Perunal and San Platon (French), 122,091 tons; and La Joya (Spanish), 19,583 tons.—(*U.S. Com. Rep., June* 19, 1918.)

Spain's Coal Crisis.—Although coal production in Spain shows an increase from 4,838,412 tons in 1915 to 5,972,474 tons in 1917, some 2,000,000 tons is still wanted to satisfy the national requirements. Imports fell from 2,504,000 tons in 1914 to 1,090,000 tons in 1917, whilst the first four months of 1918 show a decline to 174,540 tons from 536,020 tons in the corresponding months of 1917. There is little likelihood that the home production will be raised to the point of making up the difference, since confidential reports from the Spanish coal-mining companies show that, in spite of increased wages, the miners are hewing less coal per man than formerly. —(*Coll. Guard., Aug.* 9, 1918.)

Argentine Coal Mines.—Owing to the scarcity of coal brought about by the war, the Argentine Government is taking active measures to utilise coal deposits in that country. The principal difficulties are the scarcity of mining machinery and the distance of the mines from existing railways. Only one mine, the San Julian, is favourably situated as regards transport. Most of the mines will start with small equipment, which will be increased according to the yields obtained.—(*Coll. Guard., Aug.* 2, 1918.)

Danish Peat Industry.—Owing to the high cost of imported coal and the difficulty of getting supplies at the high prices, the cheap fuel consumers of Denmark have been forced to develop the native peat deposits in the central parts of Jutland. As an example of the way in which the deposits are being worked, one firm in Odense has purchased a 100 acre estate for about £5000 (nearly 5 times its pre-war agricultural value) and expects to obtain 9000 tons per annum for 3 years, before exhausting the area. The peat forms a solid layer about

30 inches thick and is overlaid by about 8 inches of soil. The top soil is removed by spades and the peat cut out in square blocks, which after several days' drying become quite hard and are ready for transport. About 80 workmen are employed at piece work rates, and earn an average weekly wage of £9 (at the current rate of exchange). After the removal of the peat the ground is useless for agriculture, as it is water-logged. If, however, a comprehensive system of land drainage were adopted, and the top soil spread over the surface again, the land should be restored to its former value.

Peat from some of the deposits does not coalesce when dried and this is treated by grinding with water. The resulting mud is drained on wooden frames, and after a few days' drying forms blocks which are not liable to crumble. Jutland peat is very low in ash, but contains a high percentage of moisture. The Government maximum price is £2 per ton f.o.r. producer's works, on a basis of 40 per cent. total ash and moisture, with an adjustment either way of 9*d*. per ton for each percent. above or below this figure. The calorific value ranges from 3600 to 4500 calories. The industry is purely an emergency war-time measure, and can hardly be expected to survive competition with imported coal.—(*Bd. of Trade J., Aug.* 8, 1918.)

Antiseptic Value of Peat.—Peat produced by the decomposition of sphagnum moss is so antiseptic and absorbent that it may be used as a dressing for wounds, and is an excellent substitute for medicated cotton. This fact has been recognised for some time in Europe, where sphagnum moss is now extensively used in preparing surgical dressings. According to Prof. Soper, there are large tracts of sphagnum bog in the northern counties of Minnesota, Wisconsin and Michigan, also in Maine, and some is found in New York and Pennsylvania. No deep excavation would be necessary, for immense quantities of sphagnum can be taken from the upper parts of the deposits.—(*Coal Age, June* 8, 1918.)

Mining Industry of Almeria Province (Spain).—A small deposit of poor quality coal is being worked in the valleys of the Andarax and Almanzora Rivers. The coal is selling at 55*s*. per ton. Under normal conditions it would not pay to work these mines.

In the Sierra de Gador region meerschaum has been found over a zone some 22 miles long by 1 mile wide. This region is being extensively exploited, and the mineral is fetching about £2 per ton.

The total number of mines (the chief being iron, lead, silver, and zinc) operated in the province in 1916 was 158, employing 5240 hands; in 1917, 167, employing 5583 hands. The total output for 1917 shows a decline on the preceding year owing to lack of tonnage for the iron ore, of which, however, over 500,000 tons was exported. Want of coal has caused the closing of several lead smelters.—(*U.S. Com. Rep., June* 14, 1918.)

Magnesite in Manchuria.—The British Consul at Dairen reports that in a prospectus issued by a mining company in Manchuria it is stated that the amount of magnesite ore existing in that country is estimated at 200,000,000 tons. The quality is said to be excellent and much superior to that of the North American product. Samples of firebrick made from it and exhibited at the Chemical Industries Exhibition, held at Tokio in 1917, were considered better in quality than similar articles imported formerly from Austria. It also yields a very good cement. The result of an analysis made in the laboratory of the Magnesite Company at Portersville, United States, of a specimen of Manchurian ore, was as follows:—Magnesia, 47·13; lime, traces; iron and aluminium, 0·64; silica, 1·48; carbonic acid and water, 50·75.—(*Bd. of Trade J., Aug.* 15, 1918).

Antimony Production in China.—Of the Chinese output of antimony, 95 per cent. comes from the Hunan Province, which produced nearly 28,000 tons during 1917. In that year the price of regulus varied greatly; it stood at 178 dollars per ton in January, rose to 250 in June, finally falling to 180 at the end of the year. The decline was due to increased output, and after the fall many smelting works and mines were shut down. A number of companies—many of them purely speculative—have been formed to mine and smelt the Hunan ores, but the Wah Chang Mining and Smelting Co. seems to be the only one that has entered the business with a serious view to development. From 1908 to the outbreak of war this company just paid its way, but since then the higher prices have allowed a good profit, and at the end of 1917 additional stock was issued. Hunan ores are practically free from arsenic, and vary from 20 to 64 per cent. antimony. The smelting process varies with the antimony content:—(*a*) The lower grades are treated by the Herrenschmidt method, in which the ore is mixed with 20 per cent. fuel and the trioxide volatilised in special furnaces; (*b*) the better grades are smelted in reverberatory furnaces to tetroxide; (*c*) the trioxide and tetroxide produced by (*a*) and (*b*), and also the highest grade ores, are treated in a reverberatory after admixture with 6 per cent. of soda and 25 per cent. of charcoal, yielding the antimony regulus of commerce. The Wah Chang works are fitted with steam power plant, electric generators, and motors. There is a well-equipped machine repair shop and large water-pumping plant to supply cooling water to the Herrenschmidt furnaces. All the control testing is performed by a works chemist and two assistants. Extensions are being considered, and it is proposed to construct a plant capable of producing 15 tons of regulus per day. This will require 4 large reverberatory furnaces, 4 ore crushers, 8 regulus furnaces, together with an additional 10 Herrenschmidt furnaces for making white oxide.—(*U.S. Com. Rep., May* 21, 1918.)

Oleaginous Products of the Yunnan Province (China).—A report on the oleaginous products of Yunnan has been drawn up by the Commercial Attaché of the Haiphong-Yunnanfu Railway and published in the Bulletin Economique de l'Indochine.

Colza is the most widely cultivated oil, and its production has increased during the war on account of the high prices of mineral oil. The colza oil is of good quality, of golden yellow colour and with very little sediment. The average price at the place of production is between 6 and 8 taels per 100 catties. The total production from districts in the railway zone is from 3100 to 3500 tons, representing 10,370 to 11,570 tons of seed, treated by crude native methods. The average price of the seeds at I Liang is 47 dollars to 57 dollars per ton.

Rape seed comes next to colza in importance. The yield amounts to 6000 to 7000 tons of seed, or 1800 to 2100 tons of oil. The present price is about the same as that of colza, but the normal price is between 18 dollars and 20 dollars per 100 catties.

Sesamum is cultivated in nearly all districts, and the supply could be greatly increased if a demand arose. It was quoted recently at Yunnanfu at 60 dollars per 100 catties.

Ground nuts, arachide, are used in sweetmeats and as food. The total production is from 1250 tons to 1550 tons per year. The price at Yunnanfu was recently 11·30 dollars per 100 catties.

Castor oil grows practically wild. Local firms estimate that they could supply about 50 tons per

year, the normal price being 3 to 4 dollars per 100 catties. The native oil shows a comparatively high degree of acidity (over 3), but more careful cultivation might remedy this. The present quotation is 167 dollars per 100 catties.

Wood oil, abrasin, is found in various districts. It is at present possible to purchase about 100 tons per annum, but the supply would increase with the demand. The price varies from 10 to 12 dollars per 140 catties.

Among other oleaginous products may be mentioned cottonseed, and also an oil obtained from a kind of persimmon. The former is chiefly used as a cattle food and the latter is used locally. Walnut oil is quoted at Yunnanfu at 18 to 20 taels per 140 catties.

The export duties are as follows: On colza, rape seed, ground nut, wood, sesamum and cotton oil, about 4·63 dollars per ton; on castor oil, 3·09 dollars per ton.

(Note.—Average exchange value of Hk. tael in 1917=4*s.* $3\frac{3}{16}$*d.* 1 cattie=604 gms.).—(*Board of Trade J., July* 25, 1918.)

Developments in Swedish Chemical Industries.—The following information taken from the Swedish press has been forwarded by H.M. Minister at Stockholm.

New sources of spirit and gas.—Two Danish inventors have succeeded in producing a product from sulphite spirit which is adapted for all motors with electric ignition. The spirit is called "Spritol," and a factory is being planned to produce it on the large scale.

A Swedish syndicate proposes to erect a distillery for the manufacture of spirit for technical purposes from sphagnum and lichens. Its application for a licence is supported by the Swedish Board of Trade and the Industrial Commission.

The problem of driving internal combustion motors by gas produced in generators using wood waste is reported to have been solved by a Swedish firm of motor manufacturers.

Fat extraction.—A superphosphate company in Stockholm is beginning the manufacture of tetrachlorethane and trichlorethylene, for purposes of oil and fat extraction.

Hydrochloric acid.—A new method for the production of hydrochloric acid is reported to have been invented by a Swedish engineer of Ludvika.

Cultivation of oil seeds.—It is estimated that Sweden will this year grow sufficient seed to produce 60 tons of rape oil with 138 tons of rape cake, 88 tons of mustard oil with 440 tons of cake, but only 25 tons of linseed oil with 65 tons of cake. With the object of encouraging the cultivation, it is proposed to give back to the farmers the pressed cake, and to allot them 300 kilo. of nitrolim for every hectare of rape sown in the autumn.—(*Board of Trade J., Aug.* 8, 1918.)

Transport and Handling of Heavy Goods After the War.—The leaders of German industry are becoming alarmed at the prospects of the import trade in raw materials after the war. The iron industry in particular regards the future with misgivings. As a consequence projects are on foot to render available home sources of supply hitherto neglected. In so far as the raw materials of the iron manufacturer are concerned, the war has made radical changes necessary. One of the pressing needs of the immediate future is to facilitate the handling of large quantities of material and thereby to cheapen transport, especially of ores and coal. By such means chiefly must the cost of manufactured goods be kept down. As a set-off to higher wages and increased freights, it is proposed to improve the harbour accommodation, to make greater use of water carriage, to build specially designed boats and railway trucks, to utilise every truck to its greatest capacity, both as to load and to time in transit, to run longer trains, to have no vehicles of transport standing idle, to handle the goods more economically by means of labour-saving and time-saving machinery for loading and unloading, and generally to speed up all operations.—(*Stahl und Eisen, June* 13, 1918.)

LEGAL INTELLIGENCE.

Defective Blast Furnace Turbo-Blower. *Rio Tinto Co., Ltd.* v. *A. E. G. Electric Co., Ltd.*

Mr. Muir Mackenzie, Official Referee, sitting at the Law Courts, London, heard cross-actions between the above companies on various dates in July last. The action began on July 1 and judgment was delivered on July 30. The Rio Tinto Co., who were regarded as the plaintiffs, claimed damages from the A. E. G. Electric Co. for failure to supply an efficient turbo-blower for blast furnaces used in extracting copper from ore, and the defendants claimed payment for the apparatus supplied. The matter had been to arbitration, and the arbitrator had found that there was a serious error in the original plans. The Rio Tinto Co. contended that the breakdown which had occurred was due to the bad design, but the defendants ascribed it to the incompetence of the plaintiff company's employees.

The Official Referee, in giving judgment, said the price for the new blower was £6458. Owing to the failure of defendants to produce complete plans by the time specified there was a delay of $3\frac{1}{2}$ months in the erection of the plant. A dispute arose when defendants asked for £1100 payment on account, as plaintiffs contended the instalment was not due until the erection of the plant was completed. The dispute continued, and defendants refused to send a man to test the plant until a second instalment was paid, although the machinery was ready for starting. Later in 1915, a test was made and the machinery broke down, the shaft becoming bent. A new shaft was sent out, but the machinery had to be shut down. A third and a stronger shaft was sent out in 1916, and since then the machinery had worked satisfactorily. Plaintiffs contended that had the new blower been satisfactory the output would have been much larger during the period in question. An arbitrator had found that there was a radical defect in the design of the machinery in that the "critical" speed was below the "working" speed. Defendants urged that the findings of the arbitrator were really in their favour, but he (the Official Referee) held that the blower as delivered by defendants in August 1914 was defective, and plaintiffs were entitled to damages arising therefrom. Defendants alleged that plaintiffs in starting the machinery themselves, in the absence of any skilled representative of the defendants, was a breach of contract, but this contention was not justified. The allegation of fraud insisted upon by the defendants was not established by the evidence. He found that defendants had broken the contract by supplying to plaintiffs a blower of radically defective design, and plaintiffs accordingly were entitled to recover such damages and expenses they had suffered in consequence. By far the largest claim by the plaintiffs—£182,000—was for damages for loss of output during the period the machinery was not available: this claim was not recoverable by the contract, and he decided that it must be excluded. Plaintiffs were entitled to such damages as on a future occasion he might decide after further argument. Defendants were entitled to £1757 on the counterclaim. He could not now give a decision as to

costs. All proceedings in the action would be stayed for ten days from the commencement of next sittings.

SACCHARIN CONTRACT DISPUTE. *Castle Tablet Co., Ltd.* v. *J. Lorimer.*

In the King's Bench Division on July 23, before Mr. Justice Bailhache, the Castle Tablet Co., Ltd., of London, N., sought to recover damages from J. Lorimer, chemical dealer, also of London, for breach of a contract, dated Feb. 15, 1918, to deliver 28 lb. of saccharin (550 strength) at 275*s.* per lb., duty paid, afloat, and early to arrive from America. The defendant admitted non-delivery, but pleaded the "war" clause of the contract, and also that plaintiffs had cancelled the contract in buying against him at 320*s.* and 340*s.* per lb. It appeared that a consignment of 50 lb. had been received from America, which had been delivered to Messrs. Fuerst Bros. under a contract with them, but no more could be obtained owing to an embargo being placed upon the product.

His Lordship gave judgment for the plaintiff company for £49, the difference between the contract price and 310*s.*, with costs.

A SODIUM SULPHIDE CONTRACT. *Mann and Cook* v. *British and French Chemical Manufacturing Co., Ltd.*

In the King's Bench Division on July 24, before Mr. Justice Roche, Messrs. Mann and Cook, merchants of Cornhill, brought an action against the British and French Chemical Manufacturing Co., Ltd., Manchester, claiming £255 15*s.*, the amount due by the defendants under an award dated January 10, 1916.

Mr. MacKinnon, for the plaintiffs, said that the defendants sold to the plaintiffs 15 tons of broken sulphide of sodium, under a contract dated June 6, 1917, in which there was an arbitration clause. Disputes arose, and the parties went to arbitration, and the umpire in his award said that the sellers (the defendants) must deliver the goods to the buyers (the plaintiffs) half in February, 1918, and the remaining half during the first half of March. In case of failure to deliver according to the award, sellers were to pay to the buyers the sum of £16 per ton for such portion that they failed to deliver in the time stated. The fee of £15 15*s.* to be paid to the sellers. Defendants had failed, said Counsel, to deliver any portion of the goods in February or March, and they had not paid the umpire's fees.

Defendants said it was an express term of the contract that payment should be net prompt cash against invoice, or before delivery if required; they had demanded payment, in a letter dated March 6, before making delivery of the goods; and the plaintiffs had failed to pay, and therefore defendants refused to deliver the goods. Plaintiffs, however, denied having received any such letter.

Mr. Maddocks, for the defendants, admitted that there had been a breach, but he was not satisfied with the figures of the award.

His Lordship, giving judgment, held that deliveries were not made under the contract as agreed upon. Therefore, the award must stand, and the plaintiffs were entitled to the amount claimed, and there would be judgment for them with costs.

The much-prized candelilla plant of Texas and Mexico, formerly a worthless weed, is now exploited to the extent of 5 million tons per annum. The wax obtained from it, valued at £2—£2 8*s.* per ton, is used for phonograph records, varnish, linoleum, celluloid and lubricating oils.—(*Capital, June* 28, 1918.)

REPORTS.

COAL CONSERVATION.

FINAL REPORT OF THE COAL CONSERVATION COMMITTEE OF THE MINISTRY OF RECONSTRUCTION. [Cd. 9084, 1*s.*]

In order to deal effectively with this many-sided problem, the main Committee divided into five sub-committees to deal, respectively, with, Mining; Power Generation and Transmission; Metallurgy; Carbonisation; and Geology. The four separate reports of these Sub-Committees are combined to form the Final Report, the Metallurgical and Carbonisation Sub-Committees having amalgamated early in 1917. The Power Generation Report, proposing a National Scheme of Electric Power Supply, has already been published (see this J., 1918, 40 R).

The Geological Sub-Committee's terms of reference were to determine what steps, if any, were necessary for the development of new coalfields and the extension of present fields. The information required for such an investigation must be obtained from two sources—geological maps, and the records of borings and underground explorations. In both cases the information was incomplete, and the Committee strongly recommends (1) that the six-inch geological survey of the coalfields be completed as soon as possible, that all maps over 30 years old be fully revised, and that provision be made for revision every 10 years; (2) that it be made compulsory to report all borings and other sinkings to the Geographical Survey, in order that systematic records may be kept, thus leading to greater efficiency in exploration.

The Mining Sub-Committee makes the very important proposal of the formation of a Ministry of Mines and Minerals, charged with the special object of conserving the coal supplies, and the coordination of all matters connected with mining which are at present divided between a large number of Government Departments and special Committees. One member (Mr. Smillie) advocates the complete State ownership of the mines, while other members are emphatically against State control of the commercial and industrial sides of the industry. It is recommended that the Geological Survey be transferred from the Board of Education to the Department for Scientific and Industrial Research, which should be in close touch with the proposed new Ministry. The new Minister should be assisted by an Advisory Board consisting of representatives of the industry (including the workmen) and eminent scientific men, and, perhaps, representatives of the chief classes of consumers.

An exhaustive inquiry has been made into the losses which occur in collieries. The amount of coal consumed for power purposes varies with the conditions of the mine (depth, length of haulage, etc.) from about 5 to 9 per cent. of the total quantity raised. It is estimated that saving could be made in many cases, especially in the smaller pits, and where antiquated machinery is in operation. In some districts, South Wales in particular, it is the custom to cast back a large amount of small coal, chiefly because of the difficulty in finding a market. The Committee points out that extensions in the production of patent fuel would absorb this surplus of smalls, and it urges the increased consumption of such fuel both for steam-raising and domestic purposes. Enormous losses are incurred in the working of the thick seams of South Staffordshire and Warwickshire. Under existing methods of working, Mr. Meachem estimated a loss of 40 per cent. or a total loss of over 115,000,000 tons of the thick coal reserves in this area. The mining of seams up to 24 ft. in thickness presents considerable difficulties, and improvements in methods can only follow the results of large scale

experiments. It would be the duty of the proposed Ministry to take this experimental work in hand. The Coal Commission of 1903-5 reckoned that of the total available coal resources in the Kingdom, about 9000 million tons would be lost in respect of the pillars, supports and barriers required to be left in the mines. The Committee recommends that these matters be studied in detail locally, as even if only a small percentage could be worked by modified methods, a considerable aggregate quantity would be saved. Waterlogging is responsible for much loss, for example in the South Staffordshire, and the Nailsea (Bristol) areas upwards of 40 million tons are "drowned out." Co-operative pumping schemes have been successful in several cases, but the South Staffordshire Mines' Drainage Commission is in serious financial difficulties.

Generally it is suggested that the proposed Ministry be empowered to take all necessary steps to prevent loss of coal, but this object might often be attained by voluntary action on the part of colliery proprietors working together.

On the question of cost of production the urgent necessity of arresting the declining output of coal per head of the persons employed is strongly emphasised. Increased wages and high cost of materials are likely to persist for some considerable time, and their effects can best be counteracted by increasing output per head and by extending the use of labour-saving appliances, such as coal-cutting machinery and face conveyors. Technical education should be promoted, scholarships for mining provided, and the workmen be disabused of the belief that increased output entails the "cutting" of rates.

As a result of the collaboration of the Carbonisation Sub-Committee with the Advisory Council for Scientific and Industrial Research, the Fuel Research Board was established in February, 1917. The two carbonisation industries, gas works and coke ovens, consume annually about 18 and 20 million tons respectively. The development of the gas industry has been seriously handicapped by war conditions, but it is expected that the results of the work of the Central Fuel Research Station will exert an important influence on future developments. Coke production is very closely bound up with the iron and steel industry, and great loss has occurred through the deep-seated prejudice against by-product coke. This prejudice is gradually abating, and at present only about 25 per cent. of metallurgical coke is made by the wasteful Beehive process. Prof. Bone, in an interesting appendix, besides showing the greater economy of by-product recovery, quotes an instance where the same coal has been carbonised by the two processes, and no appreciable difference noticed in the blast furnace.

A suggestion that has been made several times before is worked out in detail in another appendix by Mr. Talbot. An ideal steel works unit is considered to consist of a complete installation of by-product coke ovens, blast furnaces, steel furnaces and rolling mills, capable of producing 300,000 to 500,000 tons of finished steel per annum. By suitable utilisation of the coke oven and blast furnace gases, the only fuel used would be the original coal carbonised at the coke ovens, and the coal consumption need be no more than 1·6 tons per ton of finished steel.

With reference to the electric power supply scheme proposed by the Power Generation Sub-Committee, it is pointed out that the subject of the carbonisation of the coal prior to its use for power purposes is an open question, which is left for the Fuel Research Board to decide by experiment. It is further suggested that the development of the gas engine should be encouraged for use in special circumstances where small units are necessary.

The Report concludes by indicating the need for trained experts in fuel, and by expressing the hope that the Fuel Research Board will be able to provide post-graduate training in this important subject.

SUMMARY OF OUTPUT OF MINERALS IN THE UNITED KINGDOM IN 1917.

The General Report for 1917 on Mines and Quarries, Part I., Divisional Statistics and Reports (Cd. 9120, 1s.), gives the following statistics of the production of minerals from mines, quarries and brine wells:—

Minerals	Total Output 1917	Total 1916
	Tons	Tons
Alum Shale	5,555	6,261
Arsenic	2,626	2,545
Arsenical Pyrites	434	300
Barium (Compounds) ..	65,557	76,034
Bauxite	14,724	10,329
Bog Ore	1,736	1,095
Chalk	2,264,350	2,786,321
Chert, Flint, etc.	66,206	50,592
Clays* and Shale	5,842,675	6,500,388
Coal	248,499,240	256,375,366
Copper Ore and Copper Precipitate	1,159½	1,028
Fluor Spar	64,874	54,731
Gold Ore	—	1,338
Gravel and Sand	1,929,164	1,961,650
Gypsum	173,015	219,284
Igneous Rocks	4,239,405	4,843,176
Iron Ore	14,845,734	13,494,658
Iron Pyrites	8,515	10,481
Lead Ore	15,322	17,107
Lignite	900	509
Limestone (other than Chalk)	10,454,717	10,541,573
Manganese Ore	9,942	5,140
Natural Gas	(c. ft. 85,000)	(c. ft. 85,000)
Ochre, Umber, etc.	11,216	10,159
Oil Shale	3,117,658	3,009,232
Rock Salt	122,679	129,030
Salt from Brine	1,890,709	1,831,418
Sandstone	1,613,379	1,999,308
Slate	121,524	176,827
Soapstone	1,233	301
Sulphate of Strontia	2,577	2,513
Tin Ore (dressed)	6,576	7,392
Tungsten Ores	241	394
Uranium Ore	13	51
Zinc Ore	7,484	8,476
Total	295,401,139½	304,135,498

* Including china clay, china stone, and mica clay.

BRITISH PATENTS IN 1917.

According to the Thirty-fifth Annual Report of the Comptroller-General of Patents, Designs, and Trade Marks for the year 1917 (H.M.S.O., 2*d*.), 223 applications for avoidance or suspension of patent rights were made and 178 licences have been or will be granted. [The majority of these related to dye manufacture and other chemical processes.] In three cases [relating to the manufacture of glass] the patents have been suspended in favour of the applicants. In over 2000 applications for patents made by enemy subjects, patents have been sealed to the Custodian; 91 applications for the grant of licences of such patents were made [which relate mostly to chemical processes], and in 85 cases licences have been or will be granted.

A Bill to amend the 1907 Act was introduced in the House of Commons on November 19, 1917, but was not proceeded with.

Of Provisional and Complete Specifications 19,285 were filed; 253 applications were received from women inventors. Typical specimens were furnished in connexion with 8 chemical inventions, 31 sample bottles and 5 dyed or printed specimens being filed. 9,347 patents were sealed. Four petitions for the extension of the term of the patents were lodged; none of these cases has been decided.

There are now 6 patents in force which have been prolonged beyond the normal period of 14 years [of these 3 relate to chemical processes].

The number of persons who made use of the Patent Office Library was 66,195; during the year 3523 volumes of scientific text-books or periodicals were added to the Library, which now contains 55,075 works and approximately 166,500 volumes.

FORTY-SECOND ANNUAL REPORT OF H.M. INSPECTORS OF EXPLOSIVES, 1917 [Cd. 9050, 3*d*.]

In addition to the regular inspection work, a large amount of special work has been done in connexion with the various departments of the Ministry of Munitions, the Admiralty and the War Office.

During the year Orders in Council were promulgated bringing picric acid and trinitrotoluene within the scope of the Explosives Act, and TNT can no longer be manufactured for any purpose except by special licence.

There are now 183 licensed factories to which 469 visits were paid, and 702 visits were made to registered magazines, of which there are 461 on the books. The results have generally been satisfactory considering the prevailing conditions. Proceedings have been taken against two firms.

The importation of explosives has practically ceased, and licences have only been issued in two cases, relating in all to about 4700 lb.

Messrs. P. V. and F. H. Dupré, chemical advisers, examined 356 samples of which 85 were rejected. Heat test failures were about normal, but there were 43 rejections for excessive moisture, mostly due to imperfect waterproofing of cartridges containing sodium and ammonium nitrate. Only 25 new explosives have been submitted.

The following tabulation gives a comparison of the accidents reported during 1916 and 1917 :—

ACCIDENTS	1916		1917	
In manufacture ...	363		404	
In use*	278		297	
Totals	641		701	
CASUALTIES	Killed	Injured	Killed	Injured
In manufacture ...	195	598	54	330
In use*	45	274	40	310
Totals	240	872	94	640

* Including keeping and conveyance.

Of the 54 fatalities in 1917, 27 occurred in one accident where an explosion in one building was communicated to two others by a bogie load of explosive that was being moved over the intervening space.

Several accidents have occurred in the concentration of waste sulphuric acid from picric acid manufacture, one of these accounting for 5 deaths.

An accident of exceptional interest, and one fortunately without any casualties, happened at Messrs. Curtis and Harvey's Tonbridge works in May. A building, fitted with the most modern conductors, was struck by lightning, and a ton of nitrocellulose dough, digesting in alcohol, exploded. The material was in hermetically sealed iron drums which, by forming "hollow conductors," would be expected to render the contents immune from electrical effects. In no previous case has such a dough been known to explode.

The accidents in the use of explosives occurred mainly at mines and quarries, and the returns are not exceptional, having regard to the amount of unskilled labour now employed.

Experiments to test the efficiency of automatic sprinklers in extinguishing fires have been carried out with both picric acid and TNT. The conditions were as near as possible to those in actual working, and in every case the sprinklers came into action in time to keep the fire under control; in some cases they caused immediate extinction. The results point to the superiority of automatic sprinklers over the hand-worked variety, but it is suggested that the best system would be a combination of the two

Dr. Wheeler, at the Home Office Experimental Station, has carried out a series of experiments on the relative inflammability of the dusts of tetryl, picric acid, amatol, TNT and dinitrotoluol. The results are available for anyone especially interested in the subject.

GOVERNMENT ORDERS AND NOTICES.

CHLORINE AND CHLORINE COMPOUNDS ORDER, 1918.

The Minister of Munitions has issued an Order, dated September 6, placing chlorine, gaseous or liquid, and compounds commonly manufactured direct from chlorine, under control, and fixing certain maximum prices.

From September 16, a licence will be required to manufacture or use more than, in the aggregate, one ton per month of these materials, and the Ministerial regulations to avoid loss or waste of chlorine are to be observed. A licence will also be necessary for supplying quantities of chlorine or any chlorine compound exceeding 56 lb. per month.

All producers, users, sellers, etc., must furnish returns as and when required, and, in particular, returns of all stocks exceeding in the aggregate 1000 lb. must be sent to the Department of Explosives Supply, Storey's Gate, Westminster, S.W. 1, within 14 days of October 1 next.

The maximum prices fixed are :—Liquid chlorine, 6*d*. per lb.; bleaching powder, £15 per ton. These are net cash prices for deliveries f.o.r. or f.o.b. at maker's works, and include the cost of filling but not that of the containing vessels; they do not apply to sales for export, or to sales of less than 56 lb. of liquid chlorine or one ton of bleaching powder. [The full text of the Order is given in the *London Gazette* for Sept. 6.]

OTHER ORDERS.

The Coal (Pit's Mouth) Prices No. 3 Order, 1918. Board of Trade, August 17.

The Wool Noils (Control) Order, 1918. Army Council, August 19.

SULPHUR PRICES IN ITALY.—The sale prices of raw and prepared sulphur in Italy and Sicily have been fixed by an Italian Royal Decree, a copy of which may be inspected at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence).

GERMAN SUBSTITUTE DYES ON THE DANISH MARKET.—Certain samples of German "Ersatz" (substitute) colours which are being offered on the Copenhagen market have been forwarded by H.M. Commercial Attaché. These include the "Ultramarinenblau Ersatz" L.11 and L.1, and "Meuning Ersatz." Samples may be inspected by firms interested at the Department of Overseas Trade (Development and Intelligence).

—(*Bd. of Trade J., Aug.* 29, 1918.)

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, August 29 and September 5.)

OPENINGS FOR BRITISH TRADE.

A firm in Calcutta desires agencies for U.K. manufacturers of glassware, hardware, etc. [Ref. No. 71.]

Firms at Toronto and at Hamilton, Ontario, desire agencies for U.K. manufacturers of pharmaceutical products, chemicals and dyes, soap, spices, china, earthenware, glassware, crucibles, graphite, pig iron, antimony and raw metals, copper sulphate, sodium cyanide, etc. [Ref. Nos. 249, 251, 252, 256.]

A firm at Montreal desires agencies for U.K. manufacturers of cold rolled strip steel for box strapping and corrugated steel fasteners. [Ref. No. 253.]

An agent in Marseilles desires to get into touch with U.K. manufacturers of jams, pickles, preserved foods, etc., with a view to obtaining sole agencies. [Ref. No. 260.]

A firm at Bilbao desires agencies for British firms in the iron, steel and metal trades. [Ref. No. 265.]

An agent at Tetuan, Morocco, desires to represent U.K. manufacturers of, *inter alia*, drugs, candles, soap. [Ref. No. 262.]

A company at San Antonio, Texas, having supplies of candelilla wax desires to get into touch with importers in the U.K. [Ref. No. 267.]

British manufacturers of celluloid sheet are invited to make application to the Department of Overseas Trade for the name of an inquirer.

TARIFF. CUSTOMS. EXCISE.

Argentina.—For a period of six months from August 11 the import of sugar will be allowed free of duty to the extent of 125,000 metric tons of refined sugar and 75,000 metric tons of unrefined sugar.

Canada.—The *Bd. of Trade J.* for September 5 gives the new regulations which came into force on July 18 regarding the importation and sale of oleomargarine. The regulations are to remain in force so long as the present abnormal conditions continue and the determination of this period is left to the Minister of Agriculture. Orders in Council dated October 23, 1917, and November 19, 1917, have been rescinded.

Ceylon.—The export duties on copra and coconut oil are suspended for a further period of six months from June 1.

Costa Rica.—A decree dated April 8 provides that all imported merchandise shall be subject to wharfage tax at the rate of one centimo per kilogram except goods included in Nos. 1, 12, 93, 114, 130, 132 and 133 of the Customs Tariff. Among the articles affected are salt, refined sugar, compound lard, butterine, pitch, etc. A copy of the Customs Tariff may be seen at the Department of Overseas Trade.

Portugal.—From July 13 the export of wood is subject to an export surtax, and is allowed only under licence from the Ministry of Supplies and Transport.

South Africa.—The *Bd. of Trade J.* for August 29 gives a list of decisions as to the classification of various articles under the Customs Tariff. The articles include insecticides, premier jus, etc.

Spain.—A Royal Order dated August 9 fixed the amount of olive oil (in addition to the quantity already licensed) which may be exported up to the end of this year at 20,000,000 kilograms. At least 50 per cent. of the total quantity is to be exported to American countries, and all exports of oil are to be subject to a tax of 30 pesetas per 100 kilograms.

United States of America.—The import of mineral waters is allowed under licence from certain ports in the U.K. under the "back-haul privilege."

Venezuela.—The *Bd. of Trade J.* for August 29 gives a list of articles which are to pay import duty as from June 28. The list includes apparatus for sinking wells, motor car bodies and fittings, lamp shades of metal, glass or porcelain, etc.

Sulphide of carbon (sulfuro de carbono) is placed on the "Free List" as from June 28.

COMPANY NEWS.

THE PACIFIC PHOSPHATE CO., LTD.

Lord Balfour of Burleigh, in presiding at the annual meeting of this company on July 26 last, said that the policy of the Board of Agriculture to plough up grass land and thereby draw upon its stored fertility at a time of national crisis was a justifiable one, but it would entail a greater consumption of fertilisers in the future. Lack of freight had caused the Government to import phosphate from Northern Africa to the exclusion of other grades, including the very high-grade deposits of the company. After the war this country should become independent of foreign supplies of phosphate, and considerations of freight should not prevent the importation of the rich material from the Pacific, for both Germany and Scandinavia drew upon this source before the war. For this reason it is advisable that the Imperial Government should continue its control over phosphate deposits after the war.

The shipments of phosphate from the company's deposits during 1917 were about equal to the output during 1916, but freight conditions compelled marketing in the East. Phosphate has been shipped to Australia on pre-war contracts, and a considerable quantity, which was carried by vessels still running on pre-war charters, was delivered at pre-war prices. Hence Commonwealth farmers were able to buy phosphate at average prices but little in excess of those ruling before the war, whereas British and French farmers have had to pay two or three times as much. Some of the company's vessels were requisitioned by the Government and additional tonnage had to be procured at higher rates. Although Australian clients had made considerable contributions towards the excess freights, yet in view of the highly favourable position in that country he thought that a more equitable contribution to the freights in the Australian trade should be agreed to.

The report for 1917 shows a small increase in net profits, £66,430, against £62,473 in 1916. The dividend for the year is maintained at 7½ per cent., and the balance carried forward is increased to £20,000. The issued capital of the company is £787,500, of which £225,000 is in preference shares. Dividends of 25 per cent. were paid before the war.

ROBURITE AND AMMONAL, LTD.

The accounts for the year 1916, presented at the annual meeting held in London on August 13, show a trading profit of £82,216 and a net profit of £30,948, which, together with the amount brought forward, left £42,836 for distribution. The dividends already paid or now payable were 10 per cent. on the preference shares and 20 per cent. on the ordinary shares, and a 5 per cent. bonus on

each class, leaving £12,462 to be carried forward. The issued capital is £129,635.

Mr. H. A. Krohn, chairman and managing director, informed the shareholders that the balance-sheet figures for 1917 and 1918, when available, would be considerably less favourable than those for the two previous years. They no longer made any profit on raw materials, which were now supplied by the Government; the Company's function was merely to convert them into high explosives and to receive as remuneration a percentage on the costs for labour, fuel, and establishment. He could add nothing to the information already given concerning the proposed merger of the explosives firms. If it was deemed advisable to confirm the directors' provisional adhesion to the scheme, the company would join on the basis of its peace production.

LANGDALE'S CHEMICAL MANURE CO., LTD.

The directors' report for the year ended September 30, 1917, was presented at the adjourned annual meeting held at Newcastle-on-Tyne on August 10 last, Mr. W. B. Haansbergen presiding. The gross profit for the year was £23,246 on a capital of £109,000, and the net profit was the record one of £15,232. The expenditure on repairs and renewals was £7374, against £3320 in the previous year. From the net profit £8471 was deducted for munitions levy and excess profits duty (for 1916 and 1917), leaving £2736 for income-tax and carry-forward, and £5450 for a 5 per cent. dividend, free of tax. During the period under review the ordinary business of the company underwent remarkable changes. Foreign trade was stopped, the supply of sulphuric acid was seriously curtailed, but is now better, labour was scarce, plant had to be altered, and great difficulty was experienced in obtaining supplies of phosphate rock and other raw materials.

TRADE NOTES.

BRITISH.

Government Purchase of Chilean Nitrate.—According to a cablegram received on September 2, by the *Times* from its own correspondent in Valparaiso, the Finance Minister has announced to the Chamber of Deputies that the purchase has been definitely aranged, through the medium of the Chilean Government, of 15,000,000 quintals [about 1,500,000 tons] of nitrate by the British Government from the Chilean nitrate companies at the price of 13*s.* for ordinary nitrate and 13*s.* 6*d.* for refined nitrate. The press states that the Antofagasta Nitrate Company has purchased the remaining stocks of nitrate belonging to German producers, subject to the approval of the Nitrate Executive, whose consent is being requested by the Chilean Government.—(*Times, Sept.* 3, 1918.)

FOREIGN.

American Dyes for Europe.—In considering the future of the British dye industry, especially in relation to foreign markets, it is too often assumed that Germany will be our sole competitor. Other countries, however, are rapidly forging ahead in the manufacture of dyes, and American competition in particular will have to be considered. A writer in the July number of the American *Textile Colorist* is very confident about the part that American dyes are going to play. With regard to means of delivery, he points out that with the help of her new shipbuilding programme, America will emerge from the war with ships enough to serve the commerce of the entire world, and that plans have been worked out by which these ships will be chartered to commercial organisations and individual shipping concerns, thus avoiding the necessity of Government control. With regard to efficient salesmen, he states that big successes have already been won by Americans, while as to price, he relies on the fact that the output of European companies is largely allocated to war requirements, and some considerable time must elapse before they can produce a surplus for export. On the other hand, American colour factories are working to full capacity and will be in a position to deliver goods immediately. He also states that the trade-mark "Made in U.S.A." will be a sufficient guarantee of quality and reliability, and, in any case, it will give the American product a big impetus in European markets prejudiced against German trademarks.

Salt Production in Norway.—A new method of producing concentrated brine from sea water by electrical means, combined with a process for utilising waste heat, has been worked out by Henrick Bull in Norway. The sum of 20 million kroner (about £1,125,000) is available for constructing two factories, the first of which, with a capacity of 50,000 tons per annum, could be ready in a year's time, and the second six months later. The enterprise is a private one.—(*Anglo-Norweg. Tr. J., Aug.*, 1918.)

Scandinavian Pyrites.—An agreement has been concluded between the Rio Tinto Co., London, and the Export Association for Pyrites, Christiania, for the delivery of the latter's surplus production of cupriferous pyrites, after providing for certain requirements of neutral countries. The contract is to terminate at the end of 1919 or at the end of the war if prior to that date. The British authorities have promised to grant export facilities for the materials required in the prodnction of the pyrites.—(*Anglo-Norweg. Tr. J., Aug.*, 1918.)

New Prices for German Coal in Switzerland.—Under a new agreement ratified on June 3, Germany allows the exportation of 200,000 tons of coal monthly to Switzerland, at an average price of £6 17*s.* 8*d.* per metric ton at the mine. For 60,000 tons, required for household purposes, a rebate of £1 11*s.* 10*d.* per ton is granted. Serious restrictions are put on the use of German coal for manufacturing purposes, and delivery prices are much increased.—(*U.S. Com. Rep., July*, 1918.)

Philippine Islands in 1917.—The past year has been one of unparalleled prosperity in the Philippine Islands, and this is well shown by the increase of 40 per cent. in the aggregate value of imports and exports. The exports were valued at £20,000,000, an increase of £5,400,000 over 1916, while the excess of exports over imports was £6,250,000.

Manila hemp was largely responsible for these high figures, 166,758 long tons being exported, 59,000 tons of which went to Great Britain. Coconut oil also showed a remarkable development, 44,500 tons being exported, as against 15,800 tons in 1916. The combined value of copra and coconut oil amounted to £4,150,000, practically all the oil and 75 per cent. of the copra going to the U.S.A.

Sugar, however, showed no such increase, owing to the difficulty of transport and the relatively poor quality. Exports amounted to 202,655 long tons, as against the record breaking crop of 332,158 tons in 1916.—(*U.S. Com. Rep., May* 29, 1918.)

Paper, Textiles, etc., in Rosario (Argentina).—Paper and textile manufacture are being promoted in the Rosario district. A company was chartered in October, 1917, to exploit native fibres, and obtained 50,000 acres of land in the Chaco Territory on the Bermejo River. Caraguata fibre is being examined as a possible substitute for jute. There is a small paper factory at Andino in the Province of Santa Fé. Peanuts are being

cultivated in Cordoba, Tucuman, and the Chaco; the local market is good, and on a small scale the crop is profitable.—(*U.S. Com. Rep., May* 18, 1918.)

LINSEED OIL IN ARGENTINA.—The following difficulties stand in the way of the immediate extension of the linseed oil industry:—The pressing of edible oils is being substituted for that of linseed oil; lack of machinery prevents factory extension; there is no local market for linseed cake; and there is a shortage of containers for the oil. The potential annual production of linseed oil is 8000 metric tons, but the actual production has for several years been less than half this amount; in 1917 it reached about 5000 tons.—(*U.S. Com. Rep., May* 18, 1918).

QUEBRACHO EXTRACT IN ARGENTINA AND PARAGUAY.—The potential production of quebracho extract in Argentina and Paraguay is about 230,000 metric tons annually; the actual production in 1917 was 117,000 tons. The deficiency is due to lack of shipping and profitable markets. In Argentina 13 companies could produce 198,600 tons of extract; in Paraguay, 4 companies 33,000 tons, and two projected factories 5400 tons.

The most important producer is the Forestal Land, Timber, and Railways Co., at Alsina, 269, Buenos Aires, with a capital of 15,000,000 gold pesos and a potential production of 105,000 tons.—(*U.S. Com. Rep., May* 20, 1918.)

FOREIGN TRADE OF BRAZIL IN 1917.—The total foreign trade of Brazil in 1917 was valued at £104,385,000, exports accounting for £59,875,000 and imports £44,510,000. The volume of this trade was the best since the outbreak of war, and there is every indication that the country is gradually coming back to its normal foreign trade.

The exports of rubber were 33,980 tons, two-thirds of which was shipped to the United States, and nearly all the remainder to the U.K.

The exportation of cacao has increased from 29,759 tons in 1913 to 55,622 tons in 1917. In the latter year the United States took over 30 per cent. and France the bulk of the remainder. The average price was 25 per cent. less than during 1916.

Of manganese ore, the unprecedented amount of 532,855 tons was exported (122,300 tons in 1913). This tonnage was 6 per cent. more than the 1916 figure, but the value was more than 100 per cent. greater. The values of the above mentioned commodities exported were (in thousands of £'s):—Rubber £7479, cacao £2536, manganese ore £3062. There were also exported: carnauba wax (£441), gold (£473), oil-bearing fruits (£350), and sugar (£3624).—(*Bd. of Trade J., Aug.* 1, 1918.)

PRODUCTION OF JAVA SUGAR IN 1917.—The quantity of sugar produced in Java in 1917 constitutes a record, amounting to 1,760,000 tons, as against 1,580,000 tons in 1916 and 1,265,000 tons in 1915. Most of the stock was held by speculators who endeavoured to keep prices at a high level, expecting that the British Government would be a large buyer. Their hopes were not realised and a crisis arose, which necessitated the formation of a trust to sell the sugar at uniform prices.

The exports to Europe decreased by 50 per cent., several factors contributing towards this. Although a not inconsiderable portion is awaiting shipment to the United Kingdom and Switzerland, there has been a big decrease in the sales to Europe. Exports to British India show a decrease of 50,000 tons, although there has been a large increase in the exports to Singapore (whence much sugar would be transhipped to Indian ports). The following figures show the exports for the last two years: 1916, Jan.-Mar., 125,317 tons; Apl.-Dec., 1,234,503 tons; 1917, Jan.-Mar., 152,667 tons; Apl.-Dec., 972,041 tons.—(*Bd. of Trade J., July* 25, 1918.)

REVIEWS.

RUBBER: ITS PRODUCTION, CHEMISTRY, AND SYNTHESIS IN THE LIGHT OF RECENT RESEARCH. *By* A. DUBOSCQ *and* DR. A. LUTTRINGER. *English edition by* E. W. LEWIS. (*London: Charles Griffin & Co., Ltd.*, 1918.) *Price* 21*s. net. Pp. xi* + 383.

The literature on rubber is by no means extensive and the appearance of a translation of Messrs. Duboscq and Luttringer's treatise will be welcomed by English chemists generally and especially by the small band of active investigators in the fertile but still largely unexplored field of rubber chemistry.

Most of the books which have preceded the present volume have dealt at least as fully with the technology as with the chemistry of the subject, the result being that neither branch has been really exhaustively treated. Such books have served a useful purpose but a need had certainly arisen for a comprehensive work dealing exclusively with the production and chemistry of the raw, as distinct from the manufactured (vulcanised) material.

The authors, whose connexion with the French journal *Le Caoutchouc et la Guttapercha* has provided them with much information which has not been current in this country, have met this want by writing what will probably rank as the most complete and detailed account of the chemistry of rubber which has yet appeared. Although the original was published in 1913 and the translation does not include the researches of the past five years, yet it carries the subject almost up to the date of the outbreak of war and this, for the moment, will satisfy most readers.

The book is divided into three sections, the first of which, covering some 60 pages, deals with the production of raw rubber and the present position of the plantation industry, and also comprises an account of resinous and of reclaimed rubbers. The chapter on the last named which appears to be rather superfluous in a book of this type, is the only one which touches on vulcanisation and the manufacturing side of the subject. The statistics given in this section are of considerable interest as illustrating the rapidity with which the output from the plantations is increasing. From a total amount of 2200 tons in 1908 the production had risen already in 1911 to 14,000 tons and during the years immediately following the actual increases in production far exceeded those estimated by the experts. The translator gives the figures for the years 1914, 1915, and 1916 as 64,500, 96,000 and 150,000 tons respectively with an estimated figure for 1917 of 190,000 tons. When it is remembered that less than a decade back the world's production totalled about one-third of this amount only, it becomes possible to appreciate what has been achieved by rubber cultivators in the East. The Amazonian production (wild rubber) remains constant at about 38,000 tons per annum.

Section II., which occupies 154 pages, is mainly devoted to the physical and chemical properties, the analysis and the constitution of rubber; it also includes an interesting chapter on the laticiferous system, in which the various theories which have been advanced to explain the formation of rubber in the tree are critically discussed. The physical and chemical characteristics of the latex and of the coagulated rubber are minutely described and the inclusion of numerous tables drawn from recent publications and current literature, which should be of considerable service to the investigator, constitutes an important feature. The last chapter in this section deals historically with researches on the constitution of rubber, beginning with the early

work on destructive distillation and leading up to the recent controversy between Harries and Pickles as to the structure of the rubber complex.

In the third part of the book some 150 pages are allotted to a comprehensive and lucid account of the work done on the synthetic production of rubber. The investigations of Bouchardat, Tilden, Kondakow, Harries, Heinemann, Hoffman, Coutelle, Perkin, Graham, Strange, Matthews and Fernbach are fully described and impartially discussed, and in many cases the physical constants and other data relating to the various hydrocarbons isolated during the quest of artificial rubber are included. This latter is a quite valuable feature of the book in that the information supplied is frequently sufficiently detailed to render superfluous any reference to the original papers on the part of the reader. The section opens with a chapter on isoprene and its homologues, followed by three chapters dealing with the various methods by which these unsaturated hydrocarbons may be prepared. While generally describing the processes which employ fusel oil as a starting point the authors critically examine the Fernbach fermentation process and reprint the full text of the patent specification. Drawing attention to the fact that butyl and not amyl alcohol predominates amongst the products of the fermentation of carbohydrates by the Fitz bacillus, they emphasise the fact that the synthetic rubber produced from butadiene is not the same rubber as that synthesised by nature but a homologue the industrial value of which has yet to be determined.

Congratulations are due to Mr. Lewis for having introduced to the English chemist a most readable version of a valuable contribution to the literature on rubber.

S. J. Peachey.

Plant Products and Chemical Fertilisers. *By* S. Hoare-Collins. *Pp.* 236. *(London: Baillière, Tindall and Cox.) Price 7s. 6d net.*

This is one of a series of books on "Industrial Chemistry" to be issued under the editorship of Dr. S. Rideal. In his preface the author observes that the raw materials of agriculture are often the waste products of the other industries, and that the products of agriculture again form the raw material for other industries, the aim of the book being "to pick up the story of those industrial waste products which are useful as fertilisers and to carry it on through the soil and crops, until new products are available for industrial uses." No effort is made to give "encyclopædic completeness of information," the aim being "to give a fair conspectus of a large subject with an appended bibliography for those who are able to pursue their studies further."

The book consists of only 200 odd pages, and it is remarkable that in this short space the author has been able to cover the extent of ground that he has covered, without furnishing the reader with a mere banquet of bones. It is not only readable but fascinatingly readable from end to end, not merely for the casual seeker of general information on a very large subject, but also for the reader who has already a considerable knowledge of agriculture, and wishes to bring to a focus much matter with which he may have become more or less acquainted from diffuse study. In a work of this kind it is not possible to treat a large variety of subjects in equal detail; but the remarkably useful bibliography appended to each chapter, serves to direct the reader to the acquisition of more precise and detailed knowledge in whichever direction his desire "for more" may be awakened by Mr. Collins' well-chosen matter.

Prominent attention is properly called to the marvellous revolution which has already been worked in awakening the latent productive capacity of large areas of our land by the use of basic slag, and this is especially emphasised by a description of what has been effected in the increase of livestock carrying capacity by this agency at Cockle Park under the direction of the agricultural staff of the author's own College (Armstrong College, Newcastle, University of Durham).

The chapter on "Future Developments" is worth reading more than once. Greater care is properly enjoined as to treatment and storage of farmyard manure, and the need for a greater amount of artificial manures is insisted on. Even where these have been employed to a fairly large extent, it will often be found that increasing quantities will pay, it being rare in the author's view "that the amounts of manuring in practice are sufficiently large to reach the stage when the 'Law of Diminishing Returns' comes into force." "There is probably hardly any enterprise that has been so little exploited in this country as the land; consequently it is to be expected that it will yield the best returns for labour and capital."

The author believes that we should be able to grow at least half of the wheat necessary for our support. He believes in large and highly industrialised farms, and in a permanent extension of our arable land. "The advantage" he urges "in an emergency of having plenty of tillage is very marked, and if it had to be paid for in normal times the expense must be looked upon as an insurance against misfortune. To develop agriculture at home it is necessary to have more capital, labour, and machines. Farmyard manure must be better stored, more land should be cultivated, market gardens in the vicinity of towns must be increased. As far as possible, milk should be consumed in preference to butter, but where milk cannot be transported, owing to carriage difficulties, more attention should be paid to the production of cheese."

There is considerable discussion of the financial and economical aspects of the future outlook which we have not space to follow. As regards labour, the author says, "there is a considerable risk that England may lose her open-air population after the war, just exactly when she wants it most. The future may show that we are less prepared for peace than we were for war. Both old and new sources of labour must be directed to the land. There are a large number of men who were previously employed merely as routine clerks and shop assistants, who have now become accustomed to an outdoor life. They will be very unwilling to go back to an indoor life, and it is now the time to consider whether their wishes and the country's needs might not be united. Much of this routine work is now being done by women who will at the end of the war be more efficient than the returned soldiers. The returned soldier will have learnt the use of spade and pick and be more suited to agriculture or forestry. Those men who are of exceptionally high mental ability, but belong to a somewhat low physical category, will all be needed for the professions, skilled trades, and directorships. In agriculture there is room for both those who have a higher degree of mental ability, and those who are chiefly physically strong."

This brief review does not do full justice to the book. No one really interested in agriculture could fail to read it with pleasure, and apart from the intrinsic value of its own interesting matter it is worth procuring were it only for the sake of its bibliography to which reference has already been made.

Bernard Dyer.

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OBITUARY.

C. E. DYSON.

Born 1841. Died 1918.

The death of another original member of this Society has to be regretfully recorded. Charles Edward Dyson was born in Flint, and starting as a lad in the works of the United Alkali Co., the leading industrial firm in the district, he eventually became manager, and held the position until 1914. Mr. Dyson took a very active part in the public life of the borough, occupying the mayoralty for nine successive years, and eleven times in all; and he was closely associated with the Volunteer movement from the early 'sixties, retiring with the rank of major in 1906. He died on July 27 last, in his 78th year.

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Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Induchem, Finsquare, London.*]

LABOUR PROBLEMS IN CHEMICAL INDUSTRY.

D. A. BREMNER.

In common with other industries, the chemical industry of to-day is confronted with the great problem of establishing, on a sure foundation, industrial peace, efficiency and intensive productivity.

The great majority of the labour problems involved in the main problem are not peculiar to the chemical industry and may be summarised as follows:—

LABOUR PROBLEMS COMMON TO ALL INDUSTRIES.

1. The progressive development of Employers' Organisation.

2. The Whitley Scheme: Joint Standing Industrial Councils.

3. The negotiation of an agreement with the Trade Unions for the non-restoration of restriction of output and other pre-war rules and practices inimical to the industrial prosperity of the country.

4. The selection of systems of remuneration and the adjustment of wages rates to suit the post-war conditions.

5. The employment of demobilised soldiers and sailors incapacitated in various degrees by wounds or disease but still capable of performing useful work and contributing to their own support.

6. The preparation of a practical scheme for the eventual demobilisation of civil war workers with the least possible hardship.

7. The future employment of demobilised soldiers and sailors.

8. The disposal of dilutees.

9. The future employment of women workers.

10. The housing of workpeople.

11. Future provision for unemployment, invalidity, and superannuation.

12. Health and welfare of the workpeople as affected by working conditions.

13. The technical and practical training of workpeople.

1. *The progressive development of Employers' Organisation.*—It is neither possible nor necessary to elaborate fully this point here, though it has a very direct bearing on the solution of our labour problems. For the present purpose, it will suffice to suggest that the line of development should be in the direction of simplification, unification and the constitution, at the apex of the Employers' Organisations, of an elected supreme body, truly representative of the industrial employers of the whole country and capable of dealing authoritatively with the Government and the similar supreme authority of the Trade Unions.

At the present time there is much redundancy, overlapping and confusion of effort. The industrial employers have suffered not a little, especially during the war, owing to their inability to concentrate the weight of their knowledge and power at any one centre of gravity.

In view of its serious importance, it may perhaps be permissible to make reference to the open secret that the interests of employers have also suffered from the inadequacy of some of their representatives at conferences and negotiations with Ministers of State, Trade Union leaders, and Government officials. Fortunately, there are several brilliant exceptions to the rule of depressing mediocrity, and to them the whole body of employers owes a debt of gratitude for their able and courageous advocacy, which has not only served the material interests of their fellows but has given an intellectual status to the class to which they belong.

Steps should be taken to ensure that, in the difficult times to come, the protection of the employers' interests, and the presentation of their case will be entrusted only to those competent to do justice to them. The average Trade Union leader is the product of an efficient process of selection. He is a highly trained expert with an intimate knowledge of his subject, and often possessed of considerable natural gifts of quick reasoning and clear exposition. To oppose clumsy ill-equipped amateurs to such antagonists is a risky proceeding.

2. *The Whitley Scheme.*—The Government, through the Minister of Labour, has made it quite clear that it wishes and hopes to secure the general adoption of the recommendations of the Whitley Committee. There is no suggestion of compulsion and their adoption will depend upon the goodwill and co-operation of the Employers' Organisations and the Trade Unions. Neither party has yet committed itself to the proposals to the extent of initiating the formation of Joint Standing Industrial Councils for our greatest industries, where the difficulties, which they are designed to solve, exist on the largest scale and in the most acute form.

Employers, as a body, are in full sympathy and agreement with the objects of the Whitley Scheme, but differences of opinion exist as to the proper functions of the proposed Industrial Councils and the extent to which the latter are intended to, or should, supplant existing organisations and machinery. Some hold the opinion that the councils should not have executive powers and that their functions should be purely consultative and advisory. It has also been pointed out that the scheme does not provide for the national and district inter-trade co-operation so necessary when dealing with Trade Unions, whose members are employed in a number of different industries.

There is much to be said on these and other points, but it would serve no useful purpose to dilate on them here, because a National Industrial Council has just been formed by the efforts of the Chemical Employers' Federation. Ungrudging support should be given to those responsible for the execution of the policy to which the chemical industry is now committed.

3. *Post-war agreement with the Trade Unions.*—This is the key problem, on the solution of which all the other issues will depend. Unless its satisfactory solution can be achieved, industry will be unable to support the financial burdens represented by any thinkable solution of the other problems.

The Government is absolutely and unconditionally pledged to restore the pre-war conditions, including restrictions and practices which interfere with the increase of output.

At the end of the war, Trade Unions will be fully entitled to claim the redemption of that pledge and demand that any negotiations with the Government or the employers shall be opened on that basis.

Nevertheless, the position created by the pledge and the demand for its redemption will be unreal and its effects merely psychic. The three contracting parties—the State, Labour and the Employers—know that the pledge cannot be redeemed and that, if it were possible, the consequences of its exaction would be disastrous to them all.

Since the outbreak of war, the industrial world has undergone such a revolution that it is beyond the power of man to reinstate the antecedent conditions. One might as well try to put back the hand of Time. Nothing is the same or ever can be the same again. Labour knows this and has no intention of trying so hazardous an experiment.

The vast majority of the working classes fully realise that the restoration of pre-war restriction of output and certain other Trade Union rules and usages, inimical to our industrial prosperity, would entail a retrogressive movement into the slough of many other pre-war conditions, which have become extremely forbidding to the working-class family. No workers, male or female, want pre-war wages or would even be satisfied with pre-war purchasing power. Nor do they experience any painful longing for pre-war workshop conditions, or for reversion to their pre-war status in the community. They want to live; they want to count for something more than producing machines. In the words of Mr. G. J. Wardle, M.P., the well-known Labour Leader, now the Parliamentary Secretary to the Board of Trade—"Labour demands a finger in every pie and something to do with its shape and size." They want to become citizens in the best and fullest meaning of the word and there is no legitimate obstacle to the fulfilment of that desire, if they will but recognise and perform the duties as faithfully as they demand the rights of citizenship.

These being the facts and circumstances, it is clear that the thoughts and energies of the three parties to the original transaction, which cannot be completed, should be directed to the agreement of the terms and conditions of an entirely new transaction, in substitution thereof.

The objects of this transaction should be to—

(*a*) Secure the permanent abrogation by the Trade Unions of all agreements, rules and practices in restriction of output or otherwise detrimental to the progressive prosperity of our industries after the war.

(*b*) Settle the terms and conditions to be given to Labour in compensation for the above mentioned abrogation or in consideration of any other concessions made by Labour, and determine how far it may fairly be regarded as having already received such compensation.

(*c*) Establish conditions conducive to the maintenance of industrial peace and efficiency.

4. *Wages.*—Principles and percentages of advances on pre-war standards will no doubt be laid down in the main agreement, referred to in section 3, but it may be assumed that details will have to be worked out and agreed to by the Trade Unions and the Employers' Organisations concerned in the adjustment of any particular standard rate.

The higher wages of the future will necessitate the adoption of payment by results, wherever practicable.

5. *Employment of demobilised soldiers and sailors.*—The employment of soldiers and sailors, incapacitated in various degrees by wounds or disease, but still capable of performing useful work, is a serious duty devolving upon all employers.

Difficulties arise owing to their physical disabilities and considerations relating to the safety of themselves and their fellow workers, but most works could employ a proportion of such men, at wages corresponding to the value of their services. This should be a matter for friendly agreement between the Trade Unions and the Employers' Organisations. No employer worthy of the name would wish to make an extra profit out of these men. In any case safeguards could be devised for their protection from exploitation.

Unless employers voluntarily absorb these men, to whom we owe so much, it would not be surprising if legislation were introduced allotting quotas.

6. *Demobilisation of civil war workers.*—Chemical employers are by no means the least fortunately situated in this respect, but it behoves each one to picture to himself the probable conditions at his works when the order comes to stop the production of munitions of war, and endeavour to think what he is going to do about it. The problem as a whole is of vital importance and difficult of solution. For a long time past it has engaged the attention of a special committee at the Ministry of Reconstruction. It is to be hoped that it is also engaging the serious attention of the Chemical Employers' Federation and the Association of British Chemical Manufacturers.

The simultaneous throwing into unemployment of a vast horde of war workers would be disastrous, and each works should contribute towards its prevention by every means in its power. The vital necessity will be to provide the time interval required for the redistribution and absorption of the workers in peace industry. The difficulty will be to employ them during that interval without serious loss, but something can be done by looking and planning ahead.

7. *The future employment of demobilised soldiers and sailors.*—It is universally accepted as an axiomatic principle of reconstruction that the men who have fought for us shall have the first claim upon the opportunities for employment after the war. Also that, so far as it may be practicable, and is desired by them, they shall be restored to the positions they vacated at the country's call.

The duty of the employer is simple, clear and not to be denied, but, human nature being what it is, it must be expected that difficulties and disappointments will be encountered by both employer and employed. In many cases, the choice will rest between the infliction of two undeserved hardships, and the employer's only salvation will lie in firm steady adherence to the principle laid down by the national conscience.

8. *The disposal of dilutees.*—It will be a poor look out for this country, unless the scale and intensity of its industrial activity, within twelve months after the end of the war, are greatly in excess of the pre-war standard. If the required expansion takes place, some proportion of the present male and female dilutees will be absorbed into the regular industrial working community; the men in a greater proportion than the women. The surplus of dilutees, at any time, will have to return to their pre-war occupations or inactivity, as the case may be, or else seek a new means of livelihood outside the works and factories of the country.

9. *The future employment of women workers.*—The future employment of women in the departments of industry, into which they have entered in consequence of the war, will depend primarily upon the extent to which the men cannot satisfy the demand for labour.

It would be false national economy to employ women on work not peculiarly their own, at the cost of increasing the unemployment of men. On the other hand, the occupations most suitable for women should be reserved for them, so that the fullest opportunity of employment may be afforded to those who are obliged to earn their own living. It is sheer topsyturvydom to have women performing hard manual labour, in conditions which unsex them, while young men are losing their manhood in effeminate vocations. May it not be assumed that the instincts of womanhood will respond to the call of home and children, and will draw a large number of the women war workers back to their natural sphere, in which no dilutees can properly fill their place?

10. *Housing.*—Although there are many exceptions, employers as a rule do not provide housing accommodation for their workpeople. More often than not it would be beyond their power, and, if it were possible, the attempt to do so would be resented by the employees themselves. Nevertheless, any sound practical scheme for improving the housing of the working classes must be of direct and deep interest to the employer, who will be well advised to give it his close attention and whole-hearted support.

The building of new houses, on the scale contemplated, is estimated to cost something like £100,000,000. Unless the employers exert themselves to assist in preventing it, the scheme is likely to fall a prey to cranks, party politicians and a horde of parasites to whom it offers very special attractions.

11. *Provision for unemployment, invalidity, and superannuation.*—Those entitled and qualified to speak for labour, have stated that the Trade Union policy of restriction of output, and the "ca' canny" tactics of the men, were inspired by a fear of there not being enough jobs to go round and the consequent unemployment, with all its attendant tragedy in the working class home.

Greater security of employment and the assurance of at least a bare living, without the taint of charity, for the worker and his dependents, during unemployment from causes beyond his control, will be essential conditions of future industrial peace. It will also be necessary to make provision for adequate payments to the worker during sickness and after superannuation.

These are all matters for joint deliberation and action by the Government, the Trade Unions and the Employers' Organisations. No doubt they will be covered by the agreement referred to in section 3, which, we must hope, will be successfully negotiated and entered into before the termination of the war.

12 and 13. These two points cannot be further elaborated within the limits of this article.

Some Labour Problems of Special Importance in Chemical Industry.

1. Numerous classes of labour employed and large number of Trade Unions to be dealt with.

2. The large proportion of arduous, unpleasant and more or less unhealthy occupations.

3. Continuous processes. Working hours and wages.

4. Difficulties limiting the applicability of payment by results.

5. The supply of skilled process workers to meet increased post-war requirements.

1. *Numerous classes of labour employed.*—Twenty-three Trade Unions, representing process and other general workers, are parties to the wages agreement entered into with the Chemical Employers on July 3, 1917, but the whole of the workers in the chemical trades must comprise members of at least 30 Trade Unions.

The fact that members of all but five of these Unions are engaged in a wide variety of industries and trades, illustrates the necessity of co-operation between the different Employers' Organisations. It also indicates the importance of the omission, from the Whitley Scheme, of any provision for such inter-trade co-operation, to which reference has been made above under the heading of "The Whitley Scheme."

2. *The large proportion of arduous, unpleasant and more or less unhealthy occupations.*—To some extent, these disadvantages are due to the perpetuation of crude, antiquated methods, and may be diminished by improved ways and means of conducting old processes, the invention of new processes requiring less manual labour, and the progressive development of chemical engineering. There is great scope in these directions for the rising generation of chemists and engineers.

The social and economic importance of reducing the exceptionally arduous, unpleasant and unhealthy occupations, to the unavoidable minimum, may be expected to grow, under the revolutionised industrial conditions likely to follow in the train of the war.

3. *Continuous processes. Working hours and wages.*—The seven 12-hour shift system and the rates of payment for shift work, between 10 p.m. Saturday and starting time on Monday morning, have long been potential sources of labour trouble. The Chemical Employers' Federation is to be congratulated on its wisdom in undertaking to abolish the seven 12-hour shift system after the war, and in making some modification in the week-end pay.

4. *Difficulties limiting the applicability of payment by results.*—Theoretically, the payment of a worker according to the results of his work postulates his sole and complete control over all the conditions affecting his output. This condition is, of course, unattainable and, in practice, the nearness of approach to the ideal varies greatly.

In chemical work, the isolable labour unit is seldom an individual workman, but almost invariably a crew or shift of workmen. Their productivity is greatly affected by causes beyond their control, *e.g.*, quality and form of raw materials; the working condition of plant reparable only at long intervals; the efficiency of works services such as steam-heat, power, compressed air, the supply and quality of gases used in the processes, etc., etc. The processes are often sub-divided into stages or are interlinked with other processes. The index of the value of the work done is qualitative quite as much as quantitative, and, in present practice, the quality and quantity of the product, more especially if an intermediate product, are rarely both measurable in such a way, and at such a time, as to enable direct connexion to be established between the worker's effort and the result.

Possibly, these difficulties in the way of payment by results may be overcome to a limited extent, even in existing plants, and the matter is worthy of the attention of chemical manufacturers and their works managers. The writer would also venture to suggest that inventors of new or improved processes, and the designers of new chemical plants, would be well advised not to overlook the growing importance of this problem.

5. *The supply of skilled process workers to meet increased post-war requirements.*—It would be absurd to doubt our ability to solve this problem, in view of the marvellous expansive power and adaptability displayed by the chemical industry of this country, during the war. In the last four years, we have seen what may be accomplished in the way of intensified training in industrial arts and crafts, when conducted by competent teachers in accordance with a well-considered scientific scheme.

The Essence of the Labour Problem.

The labour problem, in its essence, is the world-old problem of the distribution among capital, brains and labour of the wealth produced by their joint efforts.

Their several efforts differ in kind and cannot be measured by one standard, nor are their relative values calculable by a mathematical process. Their absolute and relative values are continually changing, not only in accordance with the home supply and demand, but in response to extraneous

influences beyond control: the price of rice in Japan or the issue of a foreign loan may react on the value of labour or capital in this country.

When dividing the proceeds of their joint work, the interests of capital and labour, or capital and hired brains, are inevitably as wide apart as those of any other buyer and seller and can never become identical. They cannot deal on the same side of the counter, and the most that can be expected is that they shall sit at a round table, in friendly conference, to adjust their respective claims in conformity with the dictates of reason and justice.

LECTURES AT THE BRITISH SCIENTIFIC PRODUCTS EXHIBITION.

THE TUNGSTEN INDUSTRY.

In his lecture on August 30, Mr. J. L. F. Vogel, of the High Speed Alloys Co., Ltd., Widnes, gave an interesting review of the recent history of the tungsten industry in this country.

The first use of tungsten in steel was by Mushet in 1857, and the so-called "mushet steel" was supplied for many years by S. Osborn and Co., of Sheffield: it contained 6—8 per cent. of tungsten as against 18—20 per cent. in modern tool steels. The application of the early tungsten steels, made by Sheffield steelmakers, was limited because the machines then used were not strong enough to withstand the increased strain of working. At the Paris Exhibition of 1900, tungsten steel was shown working under conditions and at speeds which were previously unknown. As the manufacture progressed, a demand arose for tungsten in a suitable condition for alloying directly and without reduction of the tungsten ore in the steel crucibles, by which method various deleterious impurities were left in the finished product. This demand was first met by heating pure wolfram with carbon and a little additional iron to form an alloy containing 40—60 per cent. of the rare metal; it was not possible to melt ferro-tungsten with higher percentages of tungsten as only coal, coke or gas fires were then employed.

The problem of preparing pure tungsten was solved by Germans, and before long a tungsten powder containing 95—96 per cent. pure tungsten, practically free from harmful impurities, was offered and readily purchased by our steelmakers, and as a result of the more exacting demands of the latter a powder containing 96—98, or even 97—99 per cent., with 0·5 per cent. carbon was eventually produced. The metal made in this country to-day averages 98½ per cent. pure tungsten, which is fully 1 per cent. better than the best German makers formerly sent to Sheffield. Prior to the war some abortive attempts were made in this country to manufacture tungsten on a commercial basis, and from 1901—05 the lecturer conducted a small factory in London where some 300 tons was produced; but it was impossible to cope with German competition. Our attempts were but half-hearted and practically no capital was forthcoming.

The world consumption of tungsten ores rose steadily from 4000 tons per annum in 1906 to 10,000 tons in 1913, about one-half of which was produced within the Empire; but Germany practically monopolised the manufacture. Since 1914, the output of ore has nearly doubled, and the United States has become the largest producer (7000 tons in 1916 as against 1400 in 1913).

In August, 1914, high speed steel makers realised that there was barely four months' stock of tungsten in the country to satisfy a normal demand for tungsten steel, and following a Government inquiry, the Committee of High Speed Steel Makers, already in existence, decided to erect works to make tungsten powder. Firms which had used some 80 per cent. of the metal consumed in this country before the war co-operated in the formation of the High Speed Steel Alloys, Ltd., and in July, 1915, the first deliveries were made. In the meantime various private firms had embarked upon the manufacture, including the Thermo Electric Co., Blackwells, Continuous Rotation Co., British Thermit Co., Newcastle Alloys, Tyneside Alloys, Albright and Wilson, and one or two others. The Government entrusted Vice-Admiral Sir Edmund Slade with the control of the industry, and he arranged to secure the ore supply available from the British Empire at a uniform price. From an early date prices for ore, metal, and high speed steel were controlled in such a way that the steelmakers obtained their supplies of tungsten through the Government at a figure far below that ruling in other countries. Eventually the control of ore and metal was transferred to the Non-Ferrous Metals Department of the Ministry of Munitions.

The lecturer also dealt briefly with the debatable question of the relative merits of ferro-tungsten and tungsten powder. By direct reduction of the ore to ferro-tungsten the harmful impurities, sulphur, phosphorus, manganese, tin, arsenic, copper and lime are liable to be retained; on the other hand by employing carefully selected ore, and by observing certain precautions in manufacture, a ferro-tungsten can be produced which complies with a reasonable specification, and in this case can be employed successfully for making high speed steel. In steel containing lower percentages of tungsten, the permissible impurities may be higher, and ferro-tungsten of suitable purity has some advantage in melting at a low temperature. Some steelmakers prefer it for use in electric furnaces. A great advantage of the powder is that it can be produced of uniformly high grade from ores containing all manner of impurities.

With regard to the future Mr. Vogel expressed the opinion that the industry can be maintained permanently if it be given a fair chance. The gravest danger, in view of inevitable competition, is financial weakness, due largely to excess profits taxation and the stock valuation policy, together with official failure to recognise the necessity for drastic depreciation of buildings, plant and machinery. Our German rivals can afford to scrap, and do scrap, their plants in 5 years: ours are supposed to last 15 to 20, and no twenty year old factory will be able to compete with one that has been rebuilt three or four times in the same period. Further, the production at the lowest possible cost of tungsten ores in the overseas Dominions should be encouraged; and the ores should be smelted in England, thereby securing an ample supply of tungsten for the British high speed steel makers, who could then sell the finished steel in the world markets at competitive prices.

OPTICAL AND SCIENTIFIC GLASSWARE.

On September 6, Sir Herbert Jackson lectured on recent developments in the scientific glassware industry. After referring to the art of making glass as the art of mixing thoroughly, the lecturer said it was a mistake to think that the optical glass industry was a new one in this country; Messrs. Chance Bros. and Co., Ltd., of Birmingham, had been making optical glass for about seventy years. At the time of the Exhibition in 1851 this firm was doing very fine work, and many of the leading astronomers were indebted to it for their supplies. The progress made since 1914 had been very rapid. Messrs. Chance Bros. had, *inter alia*, turned out some very good spectroscopic glass, which was much

finer than ordinary optical glass, and Messrs. Wood Bros., who had begun the manufacture of the latter in 1907, had recently started a new factory with the co-operation of the Ministry of Munitions. The glass produced was of very high quality. Of the total consumption of optical glass in the two years immediately preceding the war, 10 per cent. was made in this country, 30 per cent. came from France, and 60 per cent. from Germany. In the present year 95 per cent. is being produced at home and 5 per cent. is being imported from France. The home production in the first quarter of 1918 was about a hundred times greater than it was in any quarter of 1912, and ten times greater than the total of the home produced and the imported Of the many types of optical glassware, we marketed but twelve in 1912, now we are producing seven times that number. It was untrue that the optical glass industry had been stolen by Germany. That country won it by hard work, good judgment, and by the application of scientific methods. The need for achromatic glass was early in the minds of English scientists, but the discovery was a German one. We have learnt our lesson, in future we must be self-sufficing; but it is not enough to know what we ought to do, we must do it. Speaking of scientific glass generally, Sir Herbert Jackson said that our output before the war was very inferior in quality, as well as in quantity, to that of Germany and Austria, but thanks to the close co-operation of the Ministry of Munitions, the manufacturers, and the research workers, the position had very greatly improved. In fact the time was rapidly approaching when we should be able to meet our entire needs. Fully a hundred different varieties have been experimented with and many have been completely and satisfactorily made.

NEWS FROM THE SECTIONS.

SYDNEY.

The Report for the year 1917, recently to hand, states that eight papers were read before this Section, four of which have appeared in the Transactions. Three papers, *viz.* "Notes on the Manufacture of Some Colouring Matters in England (Ultramarine)," by E. Elliott, "The Manufacture and Use of Yeasts in the Baking Industry," by S. E. Sibley, and "The Periodic Classification of the Elements in 1917," by Prof. C. E. Fawsitt, were of especial interest but were not presented for publication. Four new members were elected, and one death, that of Mr. W. A. Dixon, was recorded. Several of the members are still away from Australia serving the Empire in various capacities, but mostly assisting in the manufacture of munitions. The question of the removal by the Excise Department of the restrictions upon the use of stills and condensers has been repeatedly before the Committee, and as a result the authorities in Melbourne have decided to modify the present restrictions. In connexion with the Review section of the Journal, the Committee has appointed Mr. R. W. Challinor, of the Technical College, Sydney, to act as Corresponding Representative, and the hope is expressed that members will assist him by supplying information, etc., in order that the Section may figure more largely in the Society's publication in the future.

The University of Edinburgh, following the lead of Oxford, London, and other British Universities, proposes to establish degrees of doctor in various faculties which will be open to graduates of any university who have continued research or higher studies up to a satisfactory standard for at least two years after taking their first degree.

MEETINGS OF OTHER SOCIETIES.

THE IRON AND STEEL INSTITUTE.

The autumn meeting of this Institute, held in London, dealt with an unusually large number of papers, and the discussion had in some instances to be cut short, although three sessions were held, and several papers were taken as read. The President being M. Eugene Schneider, it was appropriate that the first communication should be from France, and M. Charpy's paper on the influence of hot deformation on the qualities of steel proved to be of great interest. Tests on large forgings showed the lines of flow in the steel to be very irregular, whilst extensive drawing out of the forging caused a diminution of strength in a transverse direction. The author's main conclusions were confirmed by other speakers, and the opinion was expressed that if the original dendritic structure of the ingot could be eliminated by heat treatment, better results would be obtained than by forging. Stress was, however, laid on the fact that hot deformation should not be confined to one direction, so that the nature, rather than the absolute amount, of the working was the important factor. The results have a bearing on the specification of tests to be made on forged steel.

Mr. McWilliam contributed calculations of the tenacity of basic steel, by means of which the latter could be determined, with a good approximation to accuracy, from the chemical analysis. The subject of hardness came up for discussion in the form of a paper by Mr. Shore, the inventor of the scleroscope, in which an attempt was made to correlate the scleroscope and Brinell hardness figures for a large range of materials. The tests being performed under the usual conditions, the relation is very indefinite, but a better result may be obtained by altering the Brinell test to give a constant indentation instead of using a constant load. Another interesting proposal was to use a diamond ball for the test, the disadvantage being the small load which the diamond will bear without fracture. In the course of the discussion, Mr. Cosmo Johns suggested that the measurement of the maximum energy which just fails to produce an indentation with a diamond point would be a fair measure of hardness. Agreement has not yet been reached as to the nature of the property which it is intended to measure when making so-called tests of hardness.

A report on the standardisation of tests for refractory materials, drawn up by a committee of the Ceramic Society, was presented by Mr. Cosmo Johns. Two classes of tests are required, one suitable for works purposes, and demanding only simple appliances, and the other adapted to the exact methods of a reference laboratory, and an opinion was expressed that the committee had failed to distinguish clearly between these requirements. Apparatus which will allow of the testing of whole bricks instead of fragments is also very desirable. The experiments of Prof. Carpenter and Mr. Coldron Smith on the action of carbon monoxide on iron below the A1 point proved to be of great interest. Chemical reaction takes place, and a carbide, which may be identical with cementite, is formed, and readily yields products containing iron, carbon, and oxygen.

Mr. Fletcher's paper on the cooling of ingots excited much discussion. Experiments on the freezing of wax ingots are shown to be misleading in some respects, but Dr. Unger and others referred to successful attempts which they had made to imitate the freezing of steel by means of small zinc ingots. Mr. Fletcher's view as to the importance of escaping gases in determining the direction of growth of the crystallites did not meet with general

acceptance, but the paper was recognised as a valuable contribution to a subject of immediate interest. Sir Robert Hadfield especially called attention to the need for a lessening of the amount of scrap produced in the steel works, as a matter of national economy.

Three papers on works practice were read. Mr. Hollings's note on the value of bosh tuyeres in the blast-furnace showed that very satisfactory results may be obtained by adopting this device, and Mr. Bagley gave a detailed review of the principles of open-hearth furnace design. Mr. Mackenzie's paper on the utilisation of waste heat from open-hearth furnaces for steam generation received less discussion than it deserved, in view of the necessity of greater fuel economy in the future, several speakers in the course of the meeting referring to the coming rationing of fuel for industrial purposes, which will call for the utmost economy of coal in iron and steel manufacture. Mr. Hurst proposed to prevent the growth of cast iron by decarburising the outer layer, whilst Mr. Whiteley gave an account of the conversion of a steel cylinder into an almost perfect sphere by repeated quenchings in water from a red heat. The communications which were taken as read included a note by Mr. Teng on phosphorus in malleable cast iron, an account of the use of magnetic analysis as supplementing thermal analysis in the study of steels, by Prof. Honda, and a description of the change of electrical resistance of hardened steels at ordinary temperatures and at 100° C., by Prof. E. D. Campbell.

INSTITUTE OF METALS.

The large number of papers presented at the autumn meeting of the Institute of Metals made it necessary to hold three sessions, and some excellent discussions took place. The first paper was by a student member, Mr. Alkins, who described experiments on the cold drawing of copper into wire, the most important result of which was to show that the properties of the metal during successive reductions of cross-section undergo a discontinuous change when a certain degree of reduction is reached. An allotropic change of the copper was suggested as the explanation, but it is possible that, if the discontinuity be a real one, and not due to some change in the conditions of drawing when the point in question is reached, the presence of minute quantities of impurities may be responsible. It was mentioned in the discussion that the fact of a sudden change in properties of copper during drawing was known to wire manufacturers, but had not been explained. The new facts brought forward involved some questions as to the measurement of hardness, a subject which was dealt with directly in the second paper, by Prof. Edwards, who has further developed his recently described method of determining hardness by the impact of a ball under load, thus converting the static Brinell test into a dynamic one, and practically eliminating the time factor. A definite relation is found for most metals between the Brinell number and the diameter of the indentation under a given energy of impact, but several metals fall off the smooth curve, and the causes of this divergence raise an interesting theoretical problem. The mechanism of the deformation when a ball impression is produced in a solid also calls for further investigation.

The subject of grain growth in metals was raised by two papers, one being by an American member, Prof. Zay Jeffries, and the other by Mr. Hanson. The former contained some data derived from a study of ductile tungsten, a metal which behaves in a somewhat disconcerting manner when deformed, making the difficulty of finding a generally applicable explanation very great. The existence of a definite germinative range of temperature, now fully established, appears to be the central fact which calls for a theoretical explanation. As was pointed out at the meeting, the early work of Prof. Ewing and his collaborators on grain growth has been overlooked by most recent writers on the subject, but Prof. Jeffries has brought forward a large body of new facts. Recrystallisation after cold working also formed the subject of a paper on sheet aluminium by Mr. Anderson, who examined the effect of short exposures of the rolled sheet to various annealing temperatures. It appears, however, that the usual British practice is to anneal aluminium for much shorter periods than those mentioned by the author as general, so that the difficulties caused by over-annealing have not presented themselves in this country. Mr. F. Johnson contributed two papers, one a useful summary of the influence of various elements on the properties of Admiralty gun metal, the other an account of some mechanical tests of the alloys of copper and zinc. It was shown in the discussion on the latter paper that comparable results for these alloys can only be obtained when special precautions are taken to ensure that the alloys are in equilibrium, and Mr. Haughton showed accurate measurements of the hardness of those members of the series which are richest in zinc. Mr. Rooney's note described a rapid method of estimating phosphorus in bronzes, based on the well known method used in steel laboratories, and offering considerable advantages. A note by Dr. Seligman and Mr. Williams reported the disintegration of some aluminium wire containing copper, which had been exposed in use to moist air and to traces of hydrogen peroxide. The wire had been overdrawn, and an outer layer broke up into aggregates of crystal grains, the ductility of the core being restored by annealing. The last note, which was by Capt. Plant, and was taken as read owing to the absence of the author on active service, dealt with the erection and working of an oil-fired furnace for making castings from scrap under difficult conditions, a successful result being obtained by using waste oil, and the furnace being built on the spot.

COPPER.

Circular No. 73 of the United States Bureau of Standards* is one of a series† to be issued on metals and alloys with the idea of grouping all the best information which the Bureau has accumulated as a result of its tests and investigations, together with that available in all records of published work on the subject. The Circulars deal primarily with the physical properties of metals and alloys, all other data and information, such as statistics of production, methods of manufacture, etc., are recorded only in so far as they have bearing on these properties. Much of the information is given in the form of tables and curves, and the latter are so reproduced that they admit of accurate interpolation of values with the aid of a millimetre rule. The endeavour has been made throughout to present only such data as have passed a critical scrutiny.

The Circular under review includes a brief outline of the sources, production, distribution, metallurgy, chemistry and physics of copper, and also

* Washington: Government Printing Office. 1918. Price 20 cents. Sold only by the Superintendent of Documents, Government Printing Office, Washington, D.C.

† Circular No. 58, dealing with invar and similar nickel steels, has already been published. No. 73 is the first to be issued on the metals; another on iron is in course of preparation.

technical details relating to the casting, working, welding, and electro-deposition of this important metal. The appendices deal with: I. Definitions of Physical Terms, II. Typical Specifications for Copper, and III. Bibliography. It is not too much to say that more information in a concise form has never appeared previously in any single publication on this metal. Among the many instructive statistical tables is one of the world's production of copper, given below:—

Production of Copper in different countries in metric tons.

Country	1911	1912	1913	1914	1915	1916
Africa	17,252	16,632	22,870	25,700	27,000	35,000
Australasia	42,510	47,772	47,325	33,782	32,512	35,000
Bolivia	2,950	4,681	3,658	3,500	3,000	4,000
Canada	25,570	34,213	34,880	33,248	47,202	53,263
Chile	33,088	39,204	39,434	38,270	47,142	66,500
Cuba	3,753	4,393	3,381	6,628	8,836	9,311
Germany	22,363	24,303	25,308	28,000	35,000	35,000
Japan	52,303	62,486	73,152	68,058	75,000	90,000
Mexico	61,884	73,617	58,323	35,436	30,969	55,160
Peru	28,500	26,483	25,487	22,876	32,410	41,625
Russia	25,747	33,550	34,316	32,000	16,000	16,000
Spain and Portugal	52,878	59,873	54,696	47,500	35,000	50,000
United States	491,634	563,260	555,990	515,164	646,212	880,750
Other countries	26,423	29,555	27,158	23,000	25,000	25,000
Total	886,855	1,020,022	1,005,978	913,162	1,061,283	1,396,609

Of the above production it is stated that in prewar days some 50 per cent. was used for electrical purposes, an estimate which probably errs on the conservative side. The Circular goes on to state:

"There are produced in the United States three well-defined grades of copper: Lake copper, electrolytic copper, and casting copper. The former, as its name indicates, is electrolytically or fire refined from the Lake Superior native copper ores and is of two grades, high conductivity and arsenical. The electrolytic copper is that which has been electrolytically refined from blister, converter, black, or lake copper. Casting copper is the most impure grade and may consist of either (1) furnace-refined converter bar or black copper from smelters whose ores carry insufficient silver and gold to pay for refining, (2) by-product copper not up to grade, or (3) copper produced by the melting up of scrap."

Further on, the British B.S. (Best Selected) Standard and Tough Coppers are described, but the information given is rather misleading. The B.S. quality is said to contain 99·75 per cent. copper and over, whereas 99·5 per cent. copper and over fills the British specification for this quality. Again, "Tough Copper" should refer only to Furnace Refined Copper containing up to ·25—·50 per cent. arsenic suitable for rolling in plates, sheets, rods, etc. The term "Standard" Copper is fairly well described as being a specification, and not a brand, of copper, and is a substitute for the former G.M.B. (good merchantable brands), the price of which varies in accordance with a schedule based on copper contents.

In the body of this report one disappointing feature predominates, namely, the inclusion of statements and findings (some contradictory to each other) of various scientific workers published through one or other of the world's numerous scientific societies or journals. It must be admitted that the work and deductions of such workers are often entirely controverted or modified by evidence or argument brought forward in subsequent discussion or correspondence, but this contingency appears to have been ignored. A Government organisation such as the Bureau of Standards possessing well-nigh plenary powers should, we venture to suggest, include in its official reports only statements and findings the accuracy of which it is prepared to vouch for; otherwise there is a serious danger of certain quotations receiving a seal of authenticity which is entirely unwarranted. For the same reason it is rather to be regretted that the Bureau has not in a greater degree directed its efforts towards the separation of the "grain" from the "chaff" in the 303 papers referred to in the long and important bibliography. A jury is badly needed to sift all this published evidence, and to place on record verdicts which can claim the confidence of those concerned, and it strikes one that a body such as the American Bureau of Standards or our own Department of Scientific and Industrial Research could well act in this capacity.

The above remarks are not intended to detract from the importance and industrial utility of the Circular, but are prompted by a wish that these documents should be so compiled that they become recognised as standard records, acceptable without serious question by all those concerned in science and industry.

The United States Bureau of Standards was, we believe, originally instituted by private enterprise, but for some time past has been a national institution under Government direction and control. Its object is apparently very similar to that of our own Department for Scientific and Industrial Research, established in 1915. Although the methods of procedure may not be quite the same, the essential object of both is to establish and encourage the continuity of scientific research and inquiry for the benefit of the nation and of the individuals concerned. As these two Government departments are working on parallel lines, we would express the hope that some measure of co-operation between them and some co-ordination of their activities may eventuate in the near future.

POTASH-FELSPAR, PHOSPHATE OF LIME, ALUM SHALES, PLUMBAGO OR GRAPHITE, MOLYBDENITE, CHROMITE, TALC AND STEATITE (SOAPSTONE, SOAP-ROCK AND POTSTONE), DIATOMITE.

The Board of Agriculture and Fisheries gives notice of the publication of a second edition of Volume 5 of the above-named Special Reports which have been prepared by the Director of the Geological Survey in response to numerous inquiries that have arisen through the conditions brought about by the war.

In the main it is a reprint of the first edition,

which deals with the occurrences and workings, past and present, of the minerals specified in the title. Some additional information on potash-felspars, steatite and diatomite has been inserted. Price 1s.

Copies may be obtained through any bookseller, from Messrs. T. Fisher Unwin, Ltd., 1 Adelphi Terrace, London, W.C. 1, who are the sole whole-sale agents to the Trade outside the County of London; or from the Director-General, Ordnance Survey Office, Southampton.

INDEXING SCIENTIFIC AND TECHNICAL INFORMATION.

A. MARSHALL.

Although I have no acquaintance with either of the systems of indexing mentioned by Mr. Rintoul on page 67 R of the issue of February 28, 1918, it appears from his description that they are perhaps more suitable for a great organisation like Nobel's than for an individual who has to do his own indexing and yet cover considerable ground. In the hope that it may prove useful to some of the members of the Society I therefore give a description of a simple system which I have evolved and found very convenient.

Whilst engaged in writing a book on explosives I found it necessary to read or re-read the whole of the available literature of the subject and make notes on it. The notes were made on pieces of foolscap paper torn to the size $6\frac{3}{4} \times 4\frac{1}{4}$ inches, on one of which it is as a rule possible to give all the essential information as well as the reference. The writing runs parallel to the long edges of the slip, and at the top is written the subject and generally a sub-heading. When the book had been published the number of the corresponding page was added and the notes were filed in the order of the page numbers in two small boxes. These measure $12 \times 7\frac{1}{4}$ inches by $4\frac{1}{4}$ inches deep, with a hinged lid 1 inch deep, and each of them is capable of holding 3000 notes or more. The notes relating to each chapter are enclosed in a double sheet of stiff note paper, and for each chapter there is also a loose partition of stiff paper measuring $7 \times 4\frac{1}{4}$ inches with a "flag" at the top $\frac{3}{8}$ inch high and extending a third of the way across the top edge, *i.e.* about $2\frac{1}{4}$ inches. On this flag is written the subject of the chapter and the page numbers. On the first partition the flag is on the left of the top edge, on the second in the middle, on the third on the right, on the fourth on the left again, and so on. I add notes to the files almost daily and am constantly referring to them. Any subject can be turned up in a few seconds.

This system is no doubt more valuable to writers of books than to others, but it should be applicable to any industry or science provided that there be a satisfactory book dealing with it. All that the indexer has to do is to write at the top of each slip the number of the page of the book dealing with the subject in question and then insert it in its proper place in the file. If he be interested in several different chemical industries he can have a separate filing box for each.

It will be noticed that pieces of thin paper are used and not cards. The advantage of the former is that they occupy far less space, and they are always available if one wants to make some notes for filing when away from home. The flimsiness of the material is not found to cause any trouble.

A disadvantage of the system is that when a new edition of the text book is brought out it may become desirable to renumber the slips. It is, however, a good thing to run through one's notes occasionally, and it does not take so long as might be imagined. One can look through a thousand notes and renumber them in a couple of hours.

Additional partitions can of course be added for any special subject about which one is collecting notes, and anyone can modify the system according to his peculiar needs and idiosyncrasies. Long manuscript notes, pamphlets and other large or bulky papers are filed on the same system in a box capable of taking sheets of foolscap size.

THE INSTITUTE OF CHEMISTRY.

The inaugural meeting of the first local section, the Liverpool and North-Western, was held in Liverpool on September 12, Mr. G. Watson Gray in the chair.

The Registrar, who was in attendance by the direction of the Council, referred to the objects to be attained by the establishment of local sections as follows:—

(*a*) To create a local organisation for Fellows and Associates of the Institute; to maintain the status and advance the interests of the profession of chemistry; to afford opportunities for inter-course amongst the members; to arrange conferences and the delivery of lectures; and to provide for the acquisition and dissemination of useful information connected with the profession and the work of the Institute.

(*b*) To give information to candidates desirous of joining the Institute; to report to the Council of the Institute, when requested, on applications from such candidates; and to provide for assistance, if desired by the Council, in the supervision of local examinations of the Institute.

(*c*) To advise the Council with respect to matters of local professional interest.

(*d*) To report to the Council on the transactions of the Section with a view to publication in the Proceedings of the Institute.

(*e*) To co-operate with the Registrar in connexion with the Appointments Register of the Institute.

(*f*) When found practicable, to form a library or museum, or both.

The Committee and the Secretary of the Provisional Liverpool Section (Mr. J. Hanley) were appointed to act in the same capacity for the newly-formed body.

The draft rules for local sections and a new scheme for the election of the Council of the Institute were discussed, and the views of the Liverpool Section on these matters will be reported to the Council at an early date. It is anticipated that local sections will also be inaugurated, during the coming session, at Manchester, Birmingham, Edinburgh, Glasgow, Gretna, and probably other centres.

The Council of the Institution of Electrical Engineers has offered a special premium of £25 to the author of the best paper on "The Co-ordination of Research in Works and Laboratories." Papers, which should not exceed 20,000 words in length, should be sent to the secretary of the Institution by November 4 next.

Messrs. Hedley and Co., Ltd., of Leytonstone, Essex, have recently addressed a letter to the Coroner for the Borough of West Ham on the subject of the inflammability of ethyl chloride. They point out that it is impossible for ethyl chloride to "catch alight" unless a naked flame is brought into contact with it, and that local press reports to the effect that a recent accident with ethyl chloride was due to cigarette smoking are therefore quite erroneous.

NEWS AND NOTES.

CANADA.

Shipments of Manganese from British Columbia. —A surface deposit of manganese ore, 6½ miles from Kaslo, British Columbia, and ¼ mile from a branch of the Canadian Pacific Railway, is yielding 25 tons of ore daily, which is being shipped to the United States. The ore carries about 40 per cent. of manganese, and the surface deposit opened up is estimated to contain from 2500 to 15,000 tons.—(*U.S. Com. Rep., July* 13, 1918.)

UNITED STATES.

Progress in Research.—The National Research Council and the National Canners' Association are jointly interested in an investigation into the real nature of ptomaines.

Research has been instituted with a view to the recovery in useful form of the fatty acids and silk gum occurring in silk mill wastes in sufficient quantities to cause trouble on sanitary sewage filter beds. The problem has both economic and chemical phases, and its solution is being undertaken jointly by a leading silk firm and the State in which the factory is located.

The Bureau of Soils is erecting an experimental plant to work upon Pacific kelp to determine the cost of recovering potash from kelp and to investigate the by-products which may be obtained. As many as eight cement mills are installing dust recovery systems involving electrolytic precipitation or steam condensation. Where the wet mix process is used a condensation of the steam is said to make possible a larger percentage of potash recovery than obtained heretofore. Work continues on alunite, green sands, etc., and there is good reason to expect the German potash monopoly to be broken.

The seriousness with which industrial research is being pursued may be illustrated by a few of the important achievements of one laboratory group. These include potash recovery from Chilean nitrate, sulphuric acid manufacture in plants not using lead, production of diphenylamine, volatile solvent recovery equalling 50 million pounds annually, a saving of nitric acid amounting to 45 million pounds yearly, two synthetic methods for toluol and two for picric acid, methods for making tetryl and dimethylaniline, four new explosives, besides important work in other fields.

American Dyes.—In order that the manufacturers and distributors of finished fabrics may know the quality of the dyes used on American fabrics, the National Aniline and Chemical Co. has just offered to make necessary scientific tests upon samples submitted to them. This is considered desirable in order that those who maintained that good work could not be done without German dyes, may be convinced that the dyes supplied at the present time, if properly used, are as durable and satisfactory as those formerly employed. It has been demonstrated that many German dyes were not as fast as the trade had been led to believe, and that, if subjected to the same rigorous tests as were applied to American dyes, they were much more fugitive. Through such work as is now being done without charge the effects of German propaganda are rapidly being overcome.

Tin Conservation.—Silk dyers are now required to recover all tin from the weighting processes, and a bulletin has been issued asking for the use of alloys without tin wherever possible, the elimination of all waste, and greater efforts for complete recovery by detinning methods, etc.

JAPAN.

The Association of Chemical Industries in Japan. —This Association was formally inaugurated at a meeting held during the first Exhibition of Chemical Products at Tokyo in November, 1917. The attendance exceeded one thousand. After an address by the Minister of Agriculture and Commerce, who spoke of the necessity of the inclusion of merchants and capitalists as well as chemists, the following resolutions were passed unanimously: I. The primary aim of the Association is to foster the development of Japanese chemical industries and to protect the interests of those connected therewith. II. A second Exhibition is to follow at an appropriate time. III. The Association to endeavour to secure the provision of home supplies of necessary raw materials. IV. When the war is over, the Association to request the Government to revise its customs regulations in the interest of those industries which have not become firmly established. V. The Government to be urged to investigate thoroughly the question of supply of materials and their due delivery to manufacturers.

The meeting was followed by the reading of papers and discussions. The lecturers and subjects were as follows:—

Colonel Yoshida, of the Army Department, "The Relation between Chemical Industry and Factory Mobilisation." Dr. Kusunose, of the Naval Department, "The Relation between the Navy and Chemical Industry." Dr. Sakata, Principal of Tokyo Higher Technical School, "The Modern Development of Chemical Industry in Japan." Baron Shibusawa, "Chemical Industry of Japan in the Past." Dr. Takamatsu, Principal of the Industrial Laboratory, "Chemical Industry of Japan, and Its Future."

The Emperor visited the Exhibition in person, presented gifts, and entertained members in his garden at Shinjuku.

The second general meeting of the Association was held on May 4, 1918, at Osaka, on the occasion of the second Exhibition. No less than ten resolutions were passed, of which the first two were identical with resolutions IV. and V. above. The remainder were as follows: (3) Taxation of industrial alcohol to be abolished. (4) Competition between chemical firms to be controlled. (5) The Association urges the Government to reduce the price of salt below 40 sens per 100 kins (8*s.* 9*d.* per ton). (6) That the Government be advised to consult with the Association as to means of effecting co-operation between the Government and the manufacturers. (7) That the Government be advised to protect the raw materials of Japanese chemical industries. (8) The exportation of chemical products should not be restricted. (9) The Government to seek the help of suitable chemists or experts to assist manufacturers, if required. (10) Government and Association to co-operate in preparing full statistics concerning all Japanese chemical industries and their products.

The following papers were submitted subsequently:—Professor K. Asahina, of the Osaka Technical College, "Oils and Fats"; Dr. K. Shimomura, "The Present Position of the Nippon Dye Manufacturing Company"; Dr. T. Takamatsu, "Means of Further Developing the Japanese Chemical Industries."

It has recently been resolved to establish branch sections of the Association at Osaka and Kiushiu.

GENERAL.

Technical-economic Chemical Literature.—In a paper read before the Verein Deutscher Chemiker and published in the *Zeitschrift für angewandte Chemie* of July 9, Prof. H. Grossmann, of Berlin, gives a description, with quotations and comments, of the first two numbers of the Review section of

this Journal. He characterises the innovation as one that in every way merits unstinted appreciation, and mindful of the aphorism "Fas est et ab hoste doceri" seeks to indicate points which might be usefully adopted in similar German publications. Commenting on the prominence given to the affairs of the Société de Chimie Industrielle, the author emphasises the desirability of establishing better and closer relations between the Verein Deutscher Chemiker and the corresponding Austrian society, and further suggests that friendly overtures should be made to like organisations in Hungary, Switzerland, Holland, and Scandinavia: it should at least be possible to publish short reports of their activities and of the papers read at their meetings.

Dr. Grossmann attaches particular importance to the publication of Parliamentary news, of Government orders and notifications, and is of opinion that these features should be developed to a much greater extent in the German technical-economic press. With reference to the bibliography, he urges the importance of including a list of technical, as well as scientific, publications in the new *Zentralblatt* (this J., 1918, 279 R); and from the purely journalistic point of view he regards the headlines of the various sections and the table of contents on the cover as thoroughly worthy of imitation. Referring to the article on "Dyeing Secrets—and their Remedy" in the second issue of the "Review," he expresses full agreement with the writer on the educational problem involved, and thinks that some such expedient as the institution of technical publicity committees to co-operate with the lay press could well be adopted in Germany.

The author of this critique has by now probably learnt that the rejuvenescence of chemical industry in the Allied countries has been attended by other marked signs of activity in the sphere of technical and economic chemical literature. In *Chemie et Industrie*, the official organ of the Société de Chimie Industrielle, France has produced a monthly journal of the highest order. In the United States, the American Ceramic Society, an old and important organisation with ten local sections and four student branches, is about to start the publication of a monthly journal which will take the place of the annual volume of Transactions. In this country the *Textile Journal* has been re-organised (this J., 1918, 201 R), and several societies are co-operating to bring out a series of chemical bibliographies and other reference works. It is true that no proposal has yet matured to expend some £125,000 on this last object, after the manner of the German Chemical Society on the occasion of its jubilee this year, but it is understood that the question of devoting a large sum of money to this purpose is now under consideration.

Cotton Textile Industries Association for Oils and Fats.—At the instigation of the Director of Oils and Fats, acting for the Food Controller, an association under the above title was recently formed to control the distribution of vegetable oils and animal fats required in the cotton textile industries,—work that had been performed hitherto by a committee appointed by the Manchester Chamber of Commerce. Users of these materials can now obtain supplies only through membership of the Association, for which the annual subscription is 5*s*. Applications should be made to the Secretary, Mr. J. L. Edmondson, at 30 Spring Gardens, Manchester. (See also this J., 1918, 35 R, 81 R.)

Forest Research in India.—The restriction of imports into India has rendered necessary the discovery of suitable indigenous substitutes for articles which were previously obtained from abroad, and in this direction the Forest Research Institute at Dehra Dun has been particularly successful. Among native timbers the chir pine is now extensively used in the manufacture of gun carriages and is said to be equal to the imported Oregon pine; home grown walnut has largely replaced the European variety for rifle-stocks; the Himalayan spruce is little, if any, inferior to the famous Sitka spruce for the manufacture of aircraft, while several Indian timbers have been found eminently suitable for making up into cotton bobbins. Considerable progress has also been made in the investigation of grasses suitable for paper manufacture. During the year 1916-17 the Forest Botanist visited the grasslands on the banks of the Brāhmaputra and identified all the dominant species, many of which are said to be suitable for paper manufacture and in sufficient supply to justify commercial exploitation. Grasses have been sent to the Titaghur Paper Mills Co. to be converted into paper, but the quantity available was insufficient to allow of its treatment in a high pressure digester, and the tests were therefore inconclusive.

Owing to the demand for leather by the troops the efforts now being made to utilise the tannin resources of the country are of particular significance. Apart from the necessity of meeting immediate requirements, however, investigations into the value of various tanning materials are of considerable importance, as they may lead to the establishment of a permanent industry. In certain directions the future already appears decidedly hopeful. Indian sumach, for example, has successfully been placed on the English market, and until freight became prohibitive commanded a ready sale. These investigations are now being carried out by the Munitions Board in co-operation with the Forest Department.

In some parts of India, such as the Punjaub and the United Provinces, the chir pine is often useless for timber, but the possibility of manufacturing "Stockholm" tar from inferior chir is now engaging the attention of the Forest Economist and the Chemical Adviser. The experiments, as far as they have gone, are distinctly promising. There is a great demand in Calcutta for a suitable tar for the jute industry and the sample produced in the Institute laboratories has been very favourably reported upon by interested companies. So far the tar has been prepared only in iron retorts, and further investigation is necessary to ascertain whether it cannot be produced in modified charcoal kilns. Given a cheap way of distilling the wood on a large scale *in situ*, there is little question that the manufacture of tar would become a very profitable industry. Almost equally important was the inquiry to ascertain whether charcoal briquettes could be manufactured from waste charcoal dust. Satisfactory briquettes were prepared in the Institute workshops by using a 6—8 per cent. gum solution of *Bauhinia retusa* as binding material, and subjecting the moist charcoal dust to a pressure of 4 tons per sq. inch in a hydraulic press. In the tests the briquettes were found to burn well, but much more slowly than the original charcoal used. These experiments have great possibilities, for it is more than probable that light charcoals would make good fuel in the briquette form. Large quantities of chir charcoal would be available if wood tar were manufactured on an extensive scale.

With regard to the antiseptic treatment of timber in India, Mr. R. S. Pearson, Economist of the Forest Research Institute, says: "India is far behind most other civilised countries in the matter of treating timber, and this may be attributed to the large supplies of woods which are exceptionally durable in their natural state. But these supplies are falling short of the ever-increasing demand, especially in connexion with sleeper woods, as prices are now so high that it is no longer profitable to convert more than a limited supply of such

woods into sleepers." Among the most promising of the methods which are being tried are those in which coal-tar creosote is used. A Calcutta firm has the matter in hand, and Mr. Pearson states that in view of the fact that three, if not four, large companies in India are producing tar in coke ovens there should be no difficulty in manufacturing creosote oils on a profitable basis. Creosotes can also be used for structural timber, but not for internal work in dwelling houses, owing to their offensive odour and to the fact that creosoted wood cannot be painted. Other preparations have been successfully tried for this purpose, notably a 2 per cent. solution of zinc chloride, which is cheaper, colourless and odourless, and quite effective provided the timber be well saturated. —(*Pioneer Mail, June* 7, 1918.)

Iron Ore in Ireland.—The total output of iron ore in the U.K. has shown a serious decline since 1880, although it has recovered a little of late years:—

1880	18,025,000 tons of ore
1890	13,781,000 ,,
1900	14,028,000 ,,
1910	15,233,000 ,,
1913	15,997,000 ,,

The imports of ore rose from 3,060,000 tons in 1880 to 6,854,000 tons in 1900. In 1913 the imports were 8,029,000 tons. The principal ore in the U.K. is siderite or spathic iron ore (iron carbonate). It is closely allied to blackband ironstone which is found in thin seams in coal pits in the North of England and in Scotland. Both these ironstones have been found in existing coalfields in Ireland, such as Kilkenny and Arigna, but little attempt has been made to develop the deposits. The raising of iron ore has, in fact, seriously diminished in Ireland during the last forty years, as the following figures of production show:

1880 ...	239,000 tons	1910 ...	65,000 tons
1890 ...	161,000 ,,	1913 ...	60,000 ,,
1900 ...	100,000 ,,	1916 ...	31,000 ,,

The Irish deposits are described by various authorities as hæmatite and magnetite. The latter appears, however, to be the chief ore present, and some specimens of it have yielded up to 80 per cent. of the oxide. An extended test, carried out over a series of weeks, showed that the content of oxide never fell below 50 per cent. and usually ranged from 50—70 per cent. It is suggested that Irish iron ore should be used in the United Kingdom in preference to Lapp ore. Although the deposits of the latter are much more extensive and therefore lend themselves to more economical working, they contain less iron and much more phosphorus (3·5—5 per cent.) than the Irish ore.—(*Statist, Aug.* 17, 1918.)

Alcohol as a Bakery By-product.—Through the seizure of a still in a bakery in New Mexico, where a quantity of alcohol was discovered that had been recovered from bake-oven fumes, considerable discussion has taken place concerning the feasibility of manufacturing alcohol as a by-product of bread.

This still was crudely constructed, the vapour from the bread being conducted from the oven into a worm, which was cooled by passing through a barrel of water. The practicability of the plan remains to be worked out.—(*The Western Brewer, July*, 1918.)

Strontium in 1917.—In 1917, over 70 per cent. of the American domestic requirements of strontium and its compounds were supplied from native materials, whereas in previous years the bulk of these compounds was imported. Even now transportation difficulties hinder the development of some of the most promising deposits. The principal American market for celestine and strontianite is in the East (particularly in Philadelphia), the prices ranging from $20—22 per short ton for celestine and $35—90 for strontianite. In 1917, about 4035 short tons of strontium ores were mined in the U.S.A. and 1700 tons of English celestine imported. These ores were chiefly converted into strontium carbonate and nitrate, a little bromide and sulphide being also sold. The chief use of these salts is for fireworks and night signals.—(*U.S. Geol. Surv., June*, 1918.)

Bauxite and Aluminium in 1917.—The quantity of bauxite marketed in the United States in 1917 was 568,690 short tons, an increase of about 34 per cent. on the corresponding figure for 1916. Of this amount, manufacturers of aluminium consumed 375,000 tons, manufacturers of aluminium sulphate and other salts 82,000 tons, makers of abrasive materials 110,000 tons, and makers of refractory materials 2400 tons. Notwithstanding the large increase in the amount of bauxite used the native supplies were almost sufficient to meet the demand. The average price paid during 1917 was $5.48 per long ton, at the shipping point.

Bauxite is graded according to its chemical composition and is sold on the basis of analysis. A low content of silica and titanium is regarded as essential and for some industries low iron is also specified. For abrasives, a lower grade of bauxite appears usable if the silica and iron are low. The greater part of the American bauxite consists of rounded pebble-like bodies set in a fine-grained matrix but in the Arkansas field the bauxite is "granitic." Bauxite of fair grade will not usually show the result of a glancing blow from a hammer, but some is much softer. Dried bauxite, when thrown on a hard floor, has a distinct rattle. The pebbles of the Georgia field resemble horn and cannot readily be broken. On grinding a sample of bauxite in an agate mortar, a good grade material will be hard to grind and will adhere tenaciously; a poorer material will be ground more easily and will adhere less, whilst a clay or kaolin will be quite soft and will not adhere at all.

No figures are available for the weight of primary aluminium metal produced in the United States in 1917, but its value is estimated at $45,882,000, an increase of 35 per cent. over the value for 1916. In addition, about $56,000 worth of the metal was imported. On March 5, 1918, the President of the United States fixed the maximum price for lots of 50 tons and over of 98—99 per cent. aluminium at 32 cents per lb. Secondary aluminium, recovered from scrap, sold for 56 cents per lb. in 1917, but like the virgin aluminium its price fell later to 35 cents.

The chief aluminium compounds made in the United States are alumina, ammonium and sodium alums, aluminium sulphate and chloride. The amount of alum manufactured decreased 28 per cent. as compared with 1916, the average price being $51.60 per short ton. On the other hand the amount of aluminium sulphate increased by 18 per cent., the average price being $32.15 per short ton. Aluminium chloride, which is used for refining mineral oils, was reported to cost $66 per short ton, 4702 tons being made.

Abrasives increased by 58 per cent. in quantity and 200 per cent. in value as compared with 1916, probably as a result of their use for munitions.

Refractory materials in which bauxite is used are of two kinds, bricks made by mixing calcined bauxite with clay and those made by fusing the bauxite electrically. The use of both these classes of bricks is extending, particularly in connexion with copper, iron and lead furnaces and cement kilns. No definite figures are available but an estimate of 2313 tons is given officially.—(*U S. Geol. Surv., June*, 1918.)

New Electric Smelting Furnaces in Sweden.—The Aktiebolaget Porjus Smältverks (capital £150,000) proposes to build two electric smelting ovens, in addition to the three now in operation. Power is derived from the local waterfall, and the company expects to manufacture 20,000 metric tons of pig iron annually.—(*U.S. Com. Rep., July* 20, 1918.)

A New Swedish Heat-insulating Material.—A new heat-insulating material now being produced in Sweden is said to be very promising. The chief constituent is a kind of fine clay found on the island of Mors. This is known as molera, and is very porous. Each grain appears to be hollow, and no doubt this fact is largely responsible for its good heat-insulating properties. The clay is made up into bricks with cork, which is consumed when the bricks are burnt, the resulting molera being extremely light. The new insulator is said to be primarily suitable for the lagging of steam pipes and boilers, but it may also have uses in other directions.—(*Gas J., Aug.* 13, 1918.)

Castor Oil Production in Malaga District.—The demand for castor oil for motor lubrication has stimulated its production. *Ricinus sanguineus* gives the best results, and is easy to grow under favourable climatic conditions. The soaked beans are planted in March, grow rapidly, and yield a crop in August. Maximum productivity is reached in three or four years. The dried pods crack, and the extracted beans are ready for pressing. This year's crop is expected to yield 60 tons of oil.

Two firms are encouraging farmers by offering seeds gratis and promising large profits. The contract prices for the dried beans are 50 and 60 pesetas respectively per 100 kilos. (2¼*d.*—2¾*d.* per lb.). Fresh contracts are to be made after the war. American machinery is to be installed for extracting 10 tons of oil in a 10-hour day.—(*U.S. Com. Rep., July* 9, 1918.)

The German Potash Industry during the War.—In view of the proposal to raise potash prices, the Government has issued to the Reichstag a detailed memorandum on the effects of the war on the potash industry. The gist of the report is that in spite of the very considerable appreciation in the share values of potash companies, the industry as a whole has suffered more than many others, but that any further raising of prices would be unfair to the agricultural community. The losses incurred by the reduction in exports to European countries, and by the total cessation of exports to America, have been to some extent counterbalanced by increased home consumption, farmers having used more potash to make up for the shortage of nitrogenous and phosphatic fertilisers. The following quantities —in double cwts. of K_2O—were exported to allied and neutral European countries in the years 1913-17 :—

	1913	1914	1915	1916	1917
Holland ..	436,700	424,200	291,000	571,200	439,200
Switzerland	34,700	42,800	25,400	67,400	47,000
Sweden ..	208,400	259,200	249,900	276,900	158,100
Norway ..	36,800	49,700	39,600	31,200	67,600
Denmark ..	75,300	75,700	78,500	153,100	67,400
Austria-Hungary	283,000	268,400	230,561	326,600	368,000
Belgium ..	152,300	114,806	108,595	104,000	144,300
Russian Poland	—	74,500	12,900	39,700	14,200

The quantities exported and the home consumption were as follows :—

	1913	1914	1915	1916	1917
Exported	5,055,960	3,684,260	1,191,500	1,570,400	1,305,890
Home consumption	6,046,780	5,357,110	5,608,250	7,266,560	8,736,960
Total ..	11,103,694	9,039,883	6,797,764	8,839,759	10,042,850
Value, mill. mks.	202½	164½	111¾	164	230½

The proportionate amounts used in agriculture and in industry were :—

	1913	1914	1915	1916	1917
Agriculture ..	90·4 %	91·2 %	92·0 %	94·1 %	95·7 %
Industry ..	9·6 %	8·8 %	8·0 %	5·9 %	4·3 %

Centralisation of management, already in evidence before the war, became still more necessary as the number of mines increased from 191 in 1914 to 209 at January 1, 1918. By this means it has been found possible to close down 99 of the 209 shafts. Lack of labour and fuel is responsible for the reduced amount of work done in connexion with treatment, development, and transport.—(*Z. angew. Chem., July* 26, 1918.)

German Iron Interests in Russia and Sweden.—The extent of the iron and manganese ore deposits in the Ukraine is shortly to be investigated by German companies, and the output rendered more accessible, particularly to the works in Upper Silesia. In the meantime negotiations are proceeding for the purchase or other form of acquisition of concessions in the district of Krivoi Rog, with a view to improving the supply of ore to Upper Silesia. The Government of the Ukraine has also undertaken to deliver considerable quantities of iron and manganese ores to Austria-Hungary, and discussions are taking place for the formation of Austro-Hungarian import syndicates for this purpose.

It is stated by the Swedish Commercial Commission that the iron-ore mines owned by German firms in Sweden are affected with others by the Swedish restriction on the exports of iron ore. The reduction in the exports to Germany is to be counterbalanced by sending increased quantities to the Western Powers. — (*Iron and Coal Tr. Rev., Aug.* 30, 1918.)

Electrification of the Donetz Basin (Russia).—The question of the electrification of the Donetz basin with a view to the betterment of the coal and iron industries of that locality is under consideration. The electric energy will be generated at a central power station, and transmitted at 180,000 volts to a distance of 200 versts. At first the power will be 96,000 kilowatts. The cost of carrying out this scheme will, it is said, not exceed a hundred million roubles.—(*Z. angew. Chem., June* 18, 1918.)

Coal Screenings and Water-gas Liquid as Fuel.—A manufacturing corporation in Long Island City, New York, recently submitted to a practical test a new artificial fuel. Everywhere in the hard coal fields of the United States there is found an enormous accumulation of culm, or mine screenings, and it was found that using 95 per cent. of this and 5 per cent. of a "special liquid," a fuel might be obtained of such consistency that it would neither fall through the grate-bars nor go up the chimney under a forced draught. The special liquid is a by-product resulting from the manufacture of carburetted water gas, of which millions of gallons are produced annually in the United States. This liquid has a high boiling point, and though the fuel is fired loose like ordinary coal, the mass is kept moist until the coal ignites. A test in the laboratories of the Columbia University gave a calorific value of 13,950 B.Th.U.—(*Gas J., Aug.* 13, 1918.)

Failure of the Hamburg Natural Gas Supply.—The natural gas wells at Neuengamme, near Hamburg, after showing failing pressure for some time past, have now ceased to yield gas. There is thus brought to a close a source of wealth to Hamburg which has lasted for some years, and has yielded a net income of £100,000 per annum. It has been specially valuable to the city since the outbreak of war, as a means of supplementing the coal-gas supply and ameliorating the effects of coal scarcity in Hamburg.—(*Gas. J., Aug.* 13, 1918.)

Iron and Coal in Russia before the War.—The world's output of coal in 1911-12 totalled 1,187,010,000 tons, and of this Russia produced 28,200,000 tons. She also produced 9,167,600 tons of naphtha, or 18·2 per cent. of the world's output.

In respect of iron ore output, Russia ranks fifth amongst the iron producing countries with 9,537,190 tons in 1913. Her exports fell steadily from 900,440 tons in 1907 to 470,000 tons in 1913. The bulk of the ore output came from the famous Krivoi Rog mines and Kertsh.

Russia produced 6·0 per cent. of the world's output of pig iron in 1913, as against the United States output of 40·2 per cent., Germany and Luxemburg with 25·0 per cent., and Great Britain with 13·6 per cent. The puddling process tends to disappear altogether in Russia, as everywhere else, and only 48,770 tons of wrought iron was produced in the country by puddling, etc., in 1913, as against 282,460 tons in 1903. One half of this output came from the Urals.—(*Iron and Coal Tr. Rev., Aug.* 16, 1918.)

Spitzbergen Coal.—The reports from the Swedish coalfields at Spitzbergen are considered very encouraging. A first consignment of 600 tons to the Swedish State is expected shortly, and a total of 6000 tons should arrive in Sweden this summer. The output should amount to 1000 tons monthly from July, and a production of 60,000 tons is expected in 1919-20. The quality of the coal at the Braganza coalfields is excellent, and its heating value is very satisfactory. The thickness of the main seam is 95 cm. (37 in.), and the deposits are calculated to contain about 100,000,000 tons.—(*Engineering, Aug.* 16, 1918.)

Electrical Purification of Coal Gas.—According to the *Elektrotechnische Rundschau*, satisfactory results have attended the removal of tar and other impurities from coal gas by means of electrical precipitation. High tension direct current is discharged between a cage made of thin wires and a tube in the middle of which is a system of wires. The presence of air in the precipitation chamber may cause explosion. The shape of the wire electrode and the direction of flow of the current are both important. For complete cleansing of the gas 0·2 kw.-hour was required in a test for 7500 cub. metres, a current of about 3 milliampères at 20,000 volts being used, and the gas exposed to the discharge for about 0·4 second in the precipitation tube. Naphthalene is removed by a second electrical precipitation. The temperature of the gas had little influence on the operation.—(*Gas J., Aug.* 13, 1918.)

Petroleum Substitutes for Oil Lamps.—The President of the Spanish Black Damp Commission, in a communication recently addressed to the Director-General of Agriculture, deals with the question of petroleum substitutes for oil lamps, tests having been carried out with miners' safety lamps. Mixtures of benzol with alcohol have been largely used, but if the proportion of benzol be increased beyond a certain point lamps are apt to smoke. A mixture containing 15 per cent. of petroleum, together with the benzol (22·5 per cent.) and alcohol (62·5 per cent.) gives a far better candle power, being 98 per cent. that of the standard petroleum lamp. The best illuminating power was obtained by adding turpentine and fusel oil to the benzol-alcohol mixture, but this substitute is apt to clog the wicks and give rise to a disagreeable odour. The illuminating power of this mixture is 1·42 times that of the standard lamp.—(*Iron and Coal Tr. Rev., Aug.* 16, 1918.)

The State Copper Mines in Finland.—During the past few years the Finnish State has been investigating the Outo Kumyn copper mines which are estimated to contain some 9,000,000 tons of ore. The State has now let the exploitation of the mines to an engineer, who represents a Finnish company, to be formed with a capital of about 15,000,000 marks, the State having the option of taking shares for 250,000 marks. The contract is for a period of 30 years, and the company is to pay a royalty of 30 per cent. on the net price, as long as that does not exceed 2000 Finnish marks per ton. On any surplus price above that figure a royalty of 50 per cent. will be payable. The above conditions are based upon a copper percentage of 4½, but only about one-third of the aggregate of ore is expected to contain that percentage of copper, the remainder averaging about 3½ per cent., and the royalty for this will be in proportion. The contract is to come into operation after the conclusion of peace between England, Germany, and Russia. The conditions of the agreement also provide for the manufacture by the company of 10,000 tons of sulphuric acid per annum.—(*Engineering, Aug.* 16, 1918.)

The Copper Mines of Russia.—A recent article in the *Wall Street Journal* shows Russia, in spite of her great wealth in copper mines, especially in her Siberian territory, to have played hitherto no great part in the production of copper. The greatest output was reached in 1913, the statistics for which year show a total production of 96,000,000 lb. in round numbers. The most important copper-producing company in South Russia is the Caucasus Copper Co., largely owned by American capitalists. Its reserves of ore in sight are estimated at 3,600,000 tons of 3·1 per cent. metallic content. Though more than ten million dollars has been spent since the year 1900 for the opening up and development of the mines the annual output has never exceeded 9,000,000 lb. The largest company in the Urals, the Kyshtim Corporation, possesses an up-to-date refinery. Its output in 1915 reached, in round numbers, 15,000,000 lb.—(*Metall u. Erz, June* 8, 1918.)

American Copper Statistics.—Preliminary statistics issued by the United States Geological Survey for the 1917 output of copper show that the smelter production was 1,886,120,721 lb., as compared with 1,927,850,548 lb. in 1916. The output of refined copper was 2,507,663,067 lb. as against 2,363,811,122 lb. in 1916. The stocks of copper on January 1, 1918, are put at 114,000,000 lb., or 14,000,000 lb. less than twelve months previously. The apparent domestic consumption in 1917 was 1,316,463,754 lb., as compared with 1,429,755,266 lb. in 1916 and 812,268 lb. in 1913. Exports in 1917 were 1,126,000,000 lb., against 784,000,000 lb. in 1916. Imports were 556,000,000 lb., against 462,000,000 lb. in 1916.—(*Iron and Coal Tr. Rev., Aug.* 2, 1918.)

Peruvian Copper Production.—It is reported that the Peruvian copper production for 1917 amounted to 44,900 tons of 2240 lb., being an increase of 3275 tons over 1916. Probably 99 per cent. of this production was shipped to the United States for treatment. Ninety per cent. of the total copper production was produced by the Cerro de Pasco and Backus and Johnston Companies, their figures being respectively 72,645,853 lb. and 24,308,373 lb. The estimated value of the total mineral production of Peru for 1916 (the latest year for which figures are available) was Lp.8,656,178, compared with Lp.5,929,845 in 1915 and Lp.4,169,307 in 1914.—(*Ch. of Comm. J., June*, 1918.)

Manganese Ore in Colon (Panama).—Manganese ore is being shipped to the United States from the Mandinga mines, 70 miles east of Colon; 18,000 tons has already been transported and 4000 tons awaits shipment.

A concession has been sought by the same syndi-

cate to mine manganese ore 12 to 15 miles south of Porto Bello, on the Boqueron, a branch of the Chagres River. The deposit seems extensive, and the demand for the ore appears to justify expenditure on special means of transport.—(*U.S. Com. Rep., July* 20, 1918.)

THE CASTOR-BEAN IN SIAM.—Although the castor-oil plant grows wild in Siam it has not hitherto been cultivated. An extensive plantation has been started by a Bangkok merchant, who anticipates a seed crop of 1000 tons. The seed is to be crushed locally and efforts are now being made to obtain the necessary machinery.—(*U.S. Com. Rep., July* 20, 1918.)

TRANSPORT OF FROZEN MILK.—Milk is being transported in large quantities over considerable distances by freezing about one-third of it into blocks of from 10 to 20 kilo. The milk containers are covered with heat-insulating materials, and are filled to about one-third of their capacity with the frozen blocks. The remaining space is filled with sterilised liquid milk at 4° C. The containers have capacities of 250 to 500 litres. Milk treated in this way will keep for at least three to four weeks, and can be transported great distances without deteriorating.—(*Elektrotech. Rundsch., June* 19, 1918.)

LEGAL INTELLIGENCE.

SULPHURIC ACID CONTRACT. *E. Packard and Co., Ltd.*, v. *S. J. Feldman and R. Partridge.*

In the King's Bench Division on July 23, before Mr. Justice Roche, Messrs. Ed. Packard and Co., manufacturers of chemical fertilisers at Ipswich, brought an action against Mr. Feldman and Mr. Partridge, claiming damages for the alleged breach of a contract by the defendants to take delivery of certain quantities of sulphuric acid. Defendants denied liability.

Mr. Leck, for the plaintiff company, said that the contract was for a year's supply of acid from about March 1, 1916. As the instalment due on the second delivery was not forthcoming by the due date, an interview took place in June, at which a Mr. Thomas connected with the Munitions Department was present. The parties were at issue as to what arrangement was made. Plaintiffs' case was that the arrangement was that for a time—five or six weeks—deliveries were to be made to the munitions works adjoining the defendants', and plaintiffs were to be paid by the Munitions Department for the acid so delivered, and that after the suspension of the contract for that short period plaintiffs were then to resume the deliveries to the defendants. At another interview, it was explained to Mr. Feldman that the arrangement was only temporary. For the whole of the remaining period of the contract defendants had taken no acid; the Ministry of Munitions had taken it all at prices below the contract price, therefore the plaintiffs claimed the difference between the amount received from the Ministry of Munitions and the amount which they would have received from the defendants. The defendants pleaded that there was an explosion at their works and that the contract was suspended during the time that the works remained unfit, but, Counsel added, the contract was subject to no such terms.

Mr. Green, on behalf of the defendants, contended that the real agreement between the parties was that the output of the plaintiffs should be delivered to the Ministry of Munitions until defendants were ready to receive it for the purposes of their own factory. A definite arrangement was made that there should be a suspension or release of both parties until notice of readiness was given by the defendants. If no notice was given, then plaintiffs were to go on delivering to the Ministry of Munitions. In these circumstances, he submitted, there was no liability on the defendants.

His Lordship held that there was no justification for the continued suspension of the contract and therefore the defendants were not excused from taking delivery. Judgment would be entered for plaintiffs with costs, and the amount of damages would be £162 10*s.*, representing the 5*s.* difference in price on 650 tons.

REPORT.

REPORT OF THE COMMITTEE OF THE PRIVY COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH FOR THE YEAR 1917-18. [H.M. Stationery Office, 4*d.*]

This publication contains the report of the Committee of Council, the names of the members of the Advisory Council and assessors thereto, the report of the Advisory Council, and four appendices.

The Report of the Committee of Council, covering the period August 1, 1917—July 31, 1918, refers to a great extension in the work of the Department. A National Fuel Research Station is being erected at East Greenwich; the National Physical Laboratory, now almost entirely devoted to war work, has come under the control of the Council, and extensions have been approved for testing chemical glass and clinical thermometers. The establishment of a Food Investigation Board has been sanctioned; a Research Board relating to the production of tin and tungsten in Cornwall has been established; and investigations relating to home grown timber, and re-afforestation after the war have been undertaken. Good progress has been made with negotiations for the establishment of industrial research associations; the scheme outlined in the last Report has been found satisfactory, and only minor changes of detail have been made. Grants have been given to the British Scientific Instrument Research Association, and the British Photographic Research Association, and conditional promises of financial assistance have been made to associations connected with the cotton, and woollen and worsted industries. Financial details follow, and the report concludes by reference to the question of superannuation for the staff of the National Physical Laboratory and to grants and expenditure for research.

After an introduction dealing with the need for scientific workers and the best means of securing them, the report of the Advisory Council proceeds to enumerate the various Industrial Research Associations which either have been or are about to be founded. These are connected with the following industries:—Photographic materials, scientific instruments, wool, cotton, Portland cement, india-rubber, motor and allied manufactures. Methods of procedure with the view of establishing research associations for as many industries as possible are then discussed.

The National Physical Laboratory, in addition to carrying out researches for war purposes, has been investigating optical glass, refractories, heat transmission, and the "oiliness" of lubricating oils. The Board of Trade is arranging to transfer its work on electrical standards to the National Physical Laboratory.

The Fuel Research Board has appointed Prof. T. Gray, of the Royal Technical College, Glasgow, to be Superintendent of the Laboratories at the newly erected Fuel Research Station at Greenwich. The Irish Peat Inquiry Committee has recently presented a report which has been considered by the Fuel Research Board and discussed at a joint con-

ference. An inquiry is being made regarding supplies of oil for naval, military and industrial purposes; and the question of gas standards is also being investigated under the direction of Prof. W. A. Bone. Other problems under consideration are the use of coal dust firing for steam boilers and furnaces, atmospheric pollution, and atmospheric conditions in deep mines. Dr. Briggs of the Heriot-Watt College, Edinburgh, has carried out experimental work under the direction of the Committee appointed to undertake research into mine rescue apparatus. A first report has been issued, and one or two further reports will follow. At the request of the War Office an investigation of a man's respiratory behaviour towards oxygen has been made, and it has been discovered that this test furnishes a criterion of physical fitness.

A Central Food Investigation Board, with sub-committees for various trades, has been appointed to consider the preservation of food by cold storage. Experiments on the freezing of fish are being conducted at South Shields, and the processes of putrefaction of meat, the chemistry of post mortem change in flesh, and the preservation of beef by cold are being investigated. The physiology of fruit and vegetables at low temperatures is also being studied, and the National Physical Laboratory is undertaking the necessary work on heat insulation and hygrometry. The Board is assisting the Ministry of Food on questions connected with oils and fats, and a research on the preparation of food is being carried out at King's College for Women under the direction of Prof. Jocelyn Thorpe. The support of mine owners in the Duchy of Cornwall has been secured for a scheme of investigation under Government control, and a Tin and Tungsten Research Board has been appointed under the chairmanship of Sir Lionel Phillips, Bart. Reports are being published from time to time.

It is recognised that research into timber is desirable in the national interest, especially in regard to processes of artificial drying, and sterilisation against diseases. Specimens of all timbers felled for war purposes have been collected and indexed, and their investigation will furnish valuable information in view of re-afforestation. A special research committee has been appointed to investigate the suitability of building materials with a view to the question of re-housing after the war. Researches are being conducted in the Heating and Ventilating Department of University College, London, and at the station of the British Fire Prevention Committee in Regent's Park. The Chairman of the Committee is Mr. Raymond Unwin.

The Researches of Prof. Kent, of Bristol University, on industrial fatigue, and on the effects of hours of work upon output, are to be extended so as to provide a basis for the restriction of hours of employment, spells of work, etc., by general legislation. An Industrial Fatigue Research Board has been constituted, under the chairmanship of Prof. Sherrington, with the following terms of reference :—"To consider and investigate the relations of the hours of labour and of other conditions of employment, including methods of work, to the production of industrial fatigue, having regard both to industrial efficiency and to the preservation of health among the workers."

The organisation of industrial research is proceeding in Canada, Australia, New Zealand, South Africa, and India, and steps are being taken to coordinate research associations in these Dominions with similar associations in the United Kingdom. A National Research Council was established in the United States of America in 1916, and President Wilson has issued an executive order putting it upon a permanent basis (Appendix III. of present Report).

The following researches now in progress are being assisted by grants-in-aid :—Atmospheric corrosion of certain metals, by Captain Bengough and Mr. Hudson; deterioration of harbour structures by sea action, from metallurgical and biological aspects, undertaken by the Institution of Civil Engineers; the fire-resisting properties of concrete, undertaken by the Concrete Institute, to be suspended till close of war; the production of a marketable hard porcelain from British materials, by Dr. Mellor and Mr. Bernard Moore, recipes for new body and glaze to be communicated to firms prepared to make *bona fide* use of same; research into the acoustics of the pianoforte, by Dr. R. S. Clay, preliminary report received.

The following aided researches have recently been undertaken :—Insulating materials for electrical purposes, by the Electrical Research Committee, to be supervised by a Joint Committee; inquiry into existing information as to the phenomena of arcing and switching, by the British Electrical and Allied Manufacturers' Association. A subscription is to be made to the International Commission of Publication of Constants and Numerical Data, provided the French subscription be continued.

The policy of making grants to students and research workers is reviewed, and the conclusions reached are summarised. No hard and fast rules have been adopted, but the Council has been guided by its knowledge of the kind of work undertaken by the professor under whom the student proposes to work. Existing arrangements are tentative, and the guiding principles adopted by the Council have been incorporated in a series of "Notes" which are circulated to the heads of departments in the universities and colleges concerned. The Council is well satisfied with the work done during the academic year 1916-17; details are given of the appointments of research students, and the grants for 1917-18 are summarised.

Finally the questions of the supply and the salaries of trained scientific workers are considered, and also applications from inventors for financial aid.

The following appendices are subjoined :—I. Research Associations and Companies Acts. II. Canada—An Act relating to the Honorary Advisory Council for Scientific and Industrial Research. III. Executive Order of the President of the United States. IV. Boards and Committees of the Department for Scientific and Industrial Research.

GOVERNMENT ORDERS AND NOTICES.

THE QUEBRACHO (DEALINGS) ORDER, 1918.

The Army Council, under date September 10, issued an Order to the effect that solid quebracho extract may no longer be bought or sold except with a permit from the Director of Raw Materials.

OTHER ORDERS.

The Woollen and Worsted (Consolidation) Amendment No. 3 Order, 1918. Army Council, Sept. 7.

The Timber Control (Amendment) Order, 1918. Board of Trade, Sept. 9.

New Sulphur Prices.—By order of the Minister of Munitions, the following revised scale of prices will apply as from September 20 :—Flowers of sulphur, £28 15*s.* per ton; roll brimstone, £22 10*s.* per ton; thirds, £17 15*s.* per ton. Applications for sulphur are to be made on special forms to be obtained from the Secretary, Sulphur Committee,

Ministry of Munitions, Department of Explosives Supply, Storey's Gate, S.W. 1.

National Service.—On September 17 last, the Ministry of National Service issued a new List of Certified Occupations, which came into force on September 26. The previous distinction between single and married men no longer obtains, and any claim for inclusion in a certified occupation must show that the applicant was employed from January 1, 1918, instead of August 15, 1915, as heretofore. The list includes:—Directing heads of businesses, managers and departmental managers, born in or before 1875, for Grade I. men, or 1895 for those in Grade II.; works chemists if born in or before 1889 (Grades I. and II.); analytical, consulting, and research chemists (1894 for both grades, if recommended by the Royal Society). Workers in the following industries are affected:—Chemical ware (stoneware and fireclay), furnace firebrick makers, fireclay goods, glass manufacture, chemical works, dye works, fertiliser manufacture, non-edible oils, edible oils and fats, margarine, and matches.

OFFICIAL TRADE INTELLIGENCE.

OPENINGS FOR BRITISH TRADE.

(From the Board of Trade Journal, September 12 and 19.)

Canadian firms manufacturing floor polish, disinfectants, insect powders, etc., asbestos-filled copper and lead gaskets for flange fittings, invite inquiries from U.K. importers. Letters should be addressed to The Canadian Government Trade Commissioner, 73, Basinghall Street, E.C. 2.

A company in Toronto desires to represent U.K. manufacturers of drugs, tanners' chemicals, rubber, paints, oils, varnishes and colours. [Ref. No. 279.]

A firm at Vancouver desires agencies for U.K. manufacturers of leather goods, chemicals, foodstuffs, etc. [Ref. No. 269.]

A firm at Calcutta desires agencies for U.K. manufacturers of heavy chemicals. [Ref. No. 277.]

An agent at Wellington, New Zealand, wishes to get into touch with U.K. manufacturers of hardware with a view to obtaining agencies, more particularly for after-war trade. [Ref. No. 284.]

An agent at Rio de Janeiro desires to represent U.K. manufacturers of anilines. [Ref. No. 286.]

British manufacturers of frames for spectacles and eyeglasses (rolled gold, nickel, etc.) now in a position to supply are invited to apply to the Department of Overseas Trade for the names of inquirers.

TARIFF. CUSTOMS. EXCISE.

Argentina.—The *Bd of Trade J.* for September 12 gives the modifications for September in the schedule of export duties. Among the articles affected are wool, tallow and melted fat.

Canada.—The Department of Customs and the Department of Inland Revenue have been amalgamated under the name of the Department of Customs and Inland Revenue.

The export of casein or lactarene is prohibited as from August 17 to all destinations, except under licence issued by the Commissioner of Customs.

Ceylon.—On and after July 3, and until the duty is re-imposed, shipments of copra and coconut oil will be allowed free of export duty.

French Colonies.—The export of wood of all kinds is prohibited from all French colonies, except Tunis and Morocco, to all destinations, except France and French colonies, as from August 26.

Malay States (Kelantan).—The *Bd. of Trade J.* for September 19 gives new rates of import and export duties on certain articles with effect from April 23. The list includes brass and copper ware, sugar, hides, etc.

Mexico.—A Presidential Decree amends as from August 11 the provisions of the Tariff Index so that different grades of iron wire are classified under a new heading, 218 A, and pay duty at the rate of 2 pesos per 100 kilograms gross weight.

The Customs duty on beer and cider has been revised with effect from July 22.

Netherlands.—The *Bd. of Trade J.* for September 19 gives a list of decisions of the Minister of Finance relating to the classification of imported goods for tariff purposes. The list includes iron powder (medicinal), magnesium powder, anethol (*p*-propenylanisol), neo-salvarsan, emetine hydrochloride, caramel extract, etc.

New Zealand.—An Order in Council dated May 27 states that "resine" is considered to be a substitute for varnish and import duty shall be payable as follows: If produced or manufactured in some part of the British Dominions, 4*s.* per gallon; otherwise, 4*s.* 9⅗*d.* per gallon.

New Zealand (Cook Islands).—On and from August 1 the duty on copra and pearl shell will be £1 per ton and £4 per ton, respectively.

United Kingdom.—A revised list has been issued of articles which may be exported without production to the Customs authorities of a Steel Exemption Certificate, provided they do not fall within the terms of any specific export prohibition.

United States of America.—The *Bd. of Trade J* for September 12 gives further recent rulings of the War Trade Board relating to import restrictions. Among the articles affected are crude rubber, Italian marble, creosote oil, shellac and other lacs.

TRADE NOTES.

BRITISH.

The United Kingdom and the Sugar Convention.—In 1912, H.M. Government gave notice of its withdrawal from the International Sugar Convention, undertaking, however, to give six months' notice before departing from the fundamental principles of the Convention "by granting either bounties on the export of sugar, or a preference to Colonial sugar, or, again, by subjecting to a different rate beet sugar and cane sugar."

H.M. Government having approved the principle of giving preference to Empire sugar has now given the requisite notice to the Belgian Government, thus liberating itself entirely from all engagements towards the Signatory Powers of the International Sugar Convention. Due regard will be paid to the interests of our allies, especially those who have suffered special economic injury from the ravages of war.—(*Board of Trade J., Sept. 5, 1918.*)

FOREIGN.

Proposed Swiss National Trade Mark.—The Swiss Chambers of Commerce propose to establish a Swiss national trade mark under the name of "S.P.E.S." (Syndicat pour l'Exportation Suisse). The mark will be confined to firms two-thirds of whose capital is Swiss, and to goods that are made in Switzerland exclusively by the Swiss. Thus any foreigners manufacturing in Switzerland will not be entitled to use the mark. This is partly directed against German penetration, numerous firms which are ostensibly Swiss being really German. If necessary, the manufacturer's name will be added to the

trade mark to prevent misuse.—(*Board of Trade J., Sept.* 5, 1918.)

SWITZERLAND IN 1916.—The war has caused a big increase in the demand for Swiss manufactured goods, together with a big decrease in the supply of the raw materials necessary for their manufacture. Thus, while the quantity of goods exported has increased by 80% since 1913, the imports have decreased by 26·9%. Hence, although the Swiss balance of trade is apparently favourable, it is so at the expense of the normal stock of raw materials. In fact, Switzerland has reached a point where its manufacturers can only accept offers on the condition that the foreign purchaser supplies the raw material. In view of the control that each belligerent exerts over its raw products and machinery, the larger Swiss manufacturing concerns are compelled to maintain two distinctly separate stocks of raw materials and also two sets of machines and manufacturing instruments.

A striking feature of the year has been the increase in the trade with the U.S.A., which now takes second place after Germany in the value of total foreign commerce, and first place in the value of imports. The trade with Great Britain has also increased, but to a much smaller extent than that with the U.S.A. and France.

The following table illustrates the sources of Swiss imports of chemical interest in 1916, together with the increases over the previous year:—

Material	Quantity	Compared with 1915	Source and share of total value
	Tons	%	%
Aniline, raw products	14,084	+480	Great Britain (48); Austria Hungary (28); Germany (19).
Cocoa beans ...	16,209	−14·5	Central Africa (80); Colombia (10·3).
Caustic potash and soda	10,058	no change	Germany (43); Great Britain (17·3); France (16); Austria Hungary (14·8).
Cocoa butter...	2,448	+70	Netherlands (62); Great Britain (24); U.S.A. (12).
Edible oils ...	10,482	−12	France (67·5); U.S.A. (26).
Petroleum oils	37,814	+4	Roumania (37); Austria Hungary (27·5); U.S.A. (35).
Oilcake and meal	29,224	+52	Italy (50); France (26); Greece (14); Spain (8).

Exports are shown in the following table in a similar manner:

Material	Quantity	Compared with 1915	Destination and share of total value
	Tons	%	%
Calcium carbide	63,945	+ 4·4	Germany (80); France (16·5).
Drugs	1,140	− 13	France (21·7); Great Britain (20·4); Russia (10); Germany (8); U.S.A. (6·8).
Aniline dyes and colours	1,560	− 14	Great Britain (46·6); U.S.A. (15·7); France (12·7); Italy (10·5); Spain (3); Brazil (2·7).
Indigo dyes ...	817	− 22	U.S.A. (35); Great Britain (31); China (10); Spain (9).
Artificial silk ...	733	− 30	Germany (35); Austria Hungary (25·8); Spain (13); U.S.A. (10); Great Britain (6·8).

Government control is extending over most of the raw materials and industrial products and it is safe to assume that it will be continued for some time after the war.—(*U.S. Com. Rep. Supp., June* 22, 1918.)

FOREIGN TRADE OF JAPAN IN 1917.—Preliminary statistics of the foreign trade of Japan in 1917 indicate large increases. The imports, valued at £108,000,000, increased by 37%, and the exports, amounting to £166,000,000, by 42%. It is interesting to note that while the exports from and the imports to the U.S.A. have increased by 40·5% and 77% respectively, the exports to Great Britain have increased by nearly 100%, while the imports from Great Britain have decreased by 23%. The trade balance against us on the year's commerce was nearly £15,000,000, as against £2,000,000 in 1916.

The following list gives the principal articles of chemical interest imported during the year, the countries of origin, and the proportion provided by each country:—

Ammonium sulphate, £300,000. U.K., 70%.
Antimony, £535,000. China, 99%.
Caustic soda and soda ash, £1,390,000. United Kingdom, 14·5%; U.S.A., 84%.
Coal tar dyes, £450,000. Germany, 41·5%; Switzerland, 13%.
Iron (unmanufactured), £2,600,000. United Kingdom, 5·5%; U.S.A., 14%; China, 37%; India, 21%.
Lead (ingot and slab), £600,000. Australia, 77%.
Nickel (ingot and grain), £107,000. U.K., 57%; U.S.A., 43%.
Nitrate of soda (crude), £1,000,000. Chile, 99·7%.
Oilcake, £5800. China, 26·4%; Kwangtung provinces, 52%; India, 14·6%.
Paper, £420,000. U.K., 30%; U.S.A., 49%.
Sugar, £1,200,000.
Tanning extract, £120,000. U.K., 8%; Straits Settlements, 34%.

The following list shows the exports and the countries of destination in a similar manner:—
Camphor, £550,000. Coal, £2,730,000 (China 37%). Isinglass, £200,000. Matches, £2,550,000 (China 16·5%, India 35%). Menthol crystals, £165,000 (India 6·7%, U.K. 26%, U.S.A. 58·5%). Paper, £1,670,000 (India 14%). Sugar, £2,800,000 (India 4%, China 67%). Sulphur, £640,000 (India 11%, Australia 50%). Zinc, £2,160,000 (U.K. 52%, India 5·7%).—(*U.S. Com. Rep., June* 10, 1918.)

CHEMICAL AND DRUG TRADE IN CHILE.—This branch of trade, which in pre-war days had become almost a German monopoly as far as distribution was concerned, deserves more study and effort than it is apparently receiving at present, if full advantage of the war situation is to be taken in the interests of British manufacturers. The control of distribution by means of wholesale and retail chemists' shops has enabled the Germans to control also the supply, which they in the past directed to Germany whenever possible, and thus gave an enormous advantage to German manufacturers. These wholesale and retail establishments have been able to a great extent to retain their position by means of supplies from the United States previous to that country going to war, and also by indirect means of importation from other countries, and they are reported to be well stocked. However, their supplies must now be greatly restricted, and this is the golden opportunity for British drug and chemical manufacturers to capture a present and future market by the establishment of a British distributing organisation. Unless they do so it is difficult to see how they can take advantage of the situation. The following are the Customs House figures for chemical goods, etc.:—

	1913	1916
	£	£
Organic chemical substances ...	150,000	120,000
Inorganic do. ...	230,000	300,000
Perfumes and drugs ...	290,000	225,000

—(*Ch. of Comm. J., Aug.*, 1918.)

FOREIGN COMPANY NEWS, ETC.—*Holland.*—The first factory for the preparation of tanning materials has been established at Waalwijk.

An amalgamation of interests has been effected between the Jürgens Vereenigde Fabrieken (formerly Jürgens, van den Bergh) and the Royal Stearin Candle Factory. Both firms are to double their capital, the last-named from 64 to 128 million florins (florin = 1*s.* 8*d.*).

Norway.—A company has been founded in Christiania to manufacture chemicals. Its capital is 1¾ million kroner (krone = 1*s.* 1½*d.*).

The Hadelands Bergverk, Grua, and the Bergverksaktieselskap, Norge, Hakedal, are to resume zinc smelting with a new process. These works belonged formerly to German interests, and for the past two years have been dormant.

The Norsk Aluminium Co. at Hoyanger on the Sogne Fjord, formed about two years ago to work raw materials supplied by the French Société des Bauxites et Alumines de Provence, is to extend its activities and to increase its capital from 10 to 15 million kroner. The water powers will be increased from 20,000 to 30,000 h.p., and the annual output of aluminium is expected to reach 6000 tons.

France.—The profit of the Société d'Electro-Chimie for the financial year was 2,327,753 francs, after allowing for war profits tax. The corresponding amount for the previous year was 3,784,039 francs.

Switzerland.—A company entitled the Société Electro-Chimique de Léman S.A. "Selsa" has been formed to manufacture electro-chemical products. The capital is 600,000 francs.

Germany.—The Deutsche Kunstleder (artificial leather) A.-G. in Kötitz, near Coswig (Schleswig), has absorbed the Bleicherei, Färberei u. Appretur-Anstalt, Bamberg A.-G., which was formerly in English hands.

The Elektrosalpetersäure A.-G., Zschornewitz, belonging to the A. E. G. Griesheim Elektron group, has announced a trading profit of 1,232,456 mk. After deducting general charges, and writing off 870,081 mk. (against 94,739 mk. in the previous year), there is a loss of 464,900 mk., bringing the total deficit up to 1,211,958 mk. on a capital of 3 million marks.—(*Z. angew. Chem., July,* 1918.)

COMPANY NEWS.

THE BRITISH OIL AND CAKE MILLS, LTD.

At the twentieth ordinary general meeting, held in London on August 29, Mr. J. W. Pearson, chairman and managing director, said that the company now possessed eleven new refinery units producing sufficient high-grade oil for a yearly output of 75,000 tons of margarine. The new margarine factory at Hull will start working very shortly, and the erection of another works is contemplated near the Bristol Channel. A new lard substitute, to be used as cooking fat, was to be manufactured at both places, and this section of the business will be carried out by a subsidiary company, the British Creameries, Ltd. (nominal capital £100,000), acting through another subsidiary, the British Extracting Co., Ltd., with a capital of £250,000, all of which was owned by the parent company. The British Oil and Cake Mills Garden Village, Ltd., had also been formed to develop a site of over 40 acres acquired at Hull for the housing of the employees.

To finance the new undertakings it is proposed to issue the balance of the ordinary share capital, bringing the total issued amount up to £2,000,000. The trading profit for the year 1917, after providing for income tax and excess profits duty, was £303,016, and the amount available for distribution £205,809. The ordinary shares received 15 per cent., and an interim dividend of 5 per cent. on account of the current year has been declared.

AMERICAN CYANAMID CO.

The report for the year ended June 30 last states that the manufacture of fertilisers has been temporarily suspended, the cyanamide made being treated to yield ammonia for conversion into ammonium nitrate. The whole capacity of the cyanamide plant at Warners, New Jersey, has been contracted for by the U.S. Ordnance Department, and the sulphuric acid production is being used by manufacturers for war purposes. Further progress has been made in the manufacture from cyanamide of a low-grade cyanide for use in gold and silver extraction. There has been an increased production of rock phosphate at the company's mines at Brewster, Florida, but shipments have fallen off owing to shortage of railway trucks. The Air Nitrates Corporation was formed late in 1917 to act as agent for the U.S. Government in constructing and operating plants for the manufacture of ammonium nitrate from cyanamide, the necessary funds being provided by the Government. All the capital stock of the Corporation, which is nominal, is owned by the Company. The Corporation receives fees for constructing and operating and the Company takes royalties for the use of its patents. Net sales amounted to $6,194,669, against $2,705,053 in the preceding year. The value of the contracts in hand up to June 30, 1919, is estimated to be $5,881,547. The net income was $1,601,410, after allowing for income and war profits taxes, depreciation, etc. The surplus of the Corporation was $432,375, for which the Cyanamid Company has not taken credit.—(*Financial Times, Sept.* 10, 1918.)

YORKSHIRE DYEWARE AND CHEMICAL CO., LTD.

The eighteenth annual report and balance sheet states that the trading profit for the year ended June 30, 1918, was £46,350, after providing for depreciation. This, added to the balance brought forward, gives £54,594, from which £25,000 is placed to reserves, and £23,142 is distributed, or has been paid, as interest on the debenture stock and in dividends on the ordinary shares. The latter receive 10 per cent. for the year plus a bonus of 18¾ per cent. (on a capital of £75,000 in 15s. shares), and £6,451 is carried forward. There are £140,000 of 4½ per cent. debentures and the reserve funds amount to £85,000.

The financial position of the company has improved greatly since 1914. The average dividend paid in the period 1915-18 was over ten times the average distribution during 1907-14.

PUBLICATIONS RECEIVED.

ORGANIC CHEMISTRY FOR ADVANCED STUDENTS. PART I., REACTIONS; PART II., STRUCTURE; PART III., SYNTHESIS. *By* J. B. COHEN, F.R.S. *Second edition. Pp.* 366, 435, *and* 378. (*London: Edward Arnold.* 1918.) *Price* 54*s.*

A HISTORY OF CHEMISTRY. *By* F. J. MOORE. *Pp.* 292. (*New York: McGraw-Hill Book Company, Inc. London: Hill Publishing Co., Ltd.* 1918.) *Price* 12*s.* 6*d.*

PETROLEUM REFINING. *By* A. CAMPBELL, *with a foreword by* SIR BOVERTON REDWOOD. *Pp.* 297. (*London: C. Griffin and Co., Ltd.*, 1918.) *Price* 25*s*

NEW REDUCTION METHODS IN VOLUMETRIC ANALYSIS. A MONOGRAPH. *By* E. KNECHT *and* E. HIBBERT. *Reissue with Additions. Pp.* 135. (*London: Longmans, Green and Co.* 1918.) *Price* 5*s.*

REVIEWS.

The Manufacture of Intermediate Products for Dyes. *By* J. C. Cain, D.Sc. *Pp.* 263. *(London: Macmillan and Co., Ltd.,* 1918.) *Price* 10*s. net.*

In this very readable volume is presented in a concise form a comprehensive summary of the literature dealing with the manufacture of intermediate products required in the preparation of synthetic dyes. This compilation should effect a great saving of time for chemists interested in the production of these intermediates, as in all probability no single library in England contains the whole of the literature consulted and abstracted.

The principal primary operations whereby the coal tar hydrocarbons are converted into intermediates are chlorination, nitration and sulphonation. The first of these processes is exemplified by the chlorination of benzene and toluene, leading respectively to chlorobenzene and benzaldehyde.

The operation of nitration, always of fundamental importance in the exploitation of coal tar hydrocarbons, has received special attention during the last four years owing to the military use of trinitrotoluene and picric acid. The author furnishes detailed information regarding the older plants used in the discontinuous nitration of benzene and its homologues and refers also to the more modern continuous nitration processes.

Sulphonation has proved to be specially useful in the naphthalene series, and attention is drawn to all the technically important sulphonic acids of this hydrocarbon and of its amino- and hydroxy-derivatives.

The production of primary aromatic amines by the reduction of nitro-compounds is fully described in the typical cases of aniline and α-naphthylamine. A significant modern development is outlined in the direct reduction by means of hydrogen in the presence of various catalysts.

The alternative process of producing amines from hydroxy-derivatives is most useful in the case of β-naphthylamine and its sulphonic acids, the reaction being facilitated by Bucherer's sulphite method.

Alkali fusion, another important secondary operation in the passage from coal tar crudes to colour intermediates, is illustrated as regards the older method of fusion in open pans by reference to the manufacture of phenol and resorcinol. These operations on benzenoid derivatives are, however, scarcely typical of alkali fusions in the naphthalene series in which processes autoclaves play an increasingly important part. Nevertheless the inquirer for details regarding β-naphthol is referred to the manufacture of phenol, and the fusion for α-naphthol is stated to be carried out precisely as in the case of the manufacture of β-naphthol.

In view of the importance of salicylic acid—it is stated to be the parent of more than 36 dyes—somewhat fuller details might have been given of its preparation, especially as this process is also involved in the manufacture of 2-hydroxy-3-naphthoic acid, the anilide of which is of sufficient importance to merit notice.

Now that the German monopoly of anthraquinone dyes of the indanthrene and alizarin saphirol series is being attacked, special importance attaches to the summary of the preparations in the anthracene series, which forms the concluding section of the work.

In every section of this treatise there are full references to patent literature and to original memoirs, and an appendix furnishes useful data of the strengths of acids and alkalis. A name index would be an additional guide to the copious bibliography interspersed throughout the book.

G. T. Morgan.

The Works Manager To-day. *By* Sidney Webb. *Pp.* 162. *(London: Longmans, Green and Co.,* 1917.) *Price* 3*s.* 6*d. net.*

Starting from the realisation of the professional nature of the works manager's functions and the essential part they play in industrial organisation, Mr. Webb proceeds to define the requirements of enlightened management under the conditions of the present time. The brochure is in no sense a complete survey of the field, but few will disagree with the desiderata which Mr. Webb postulates in his ideal works manager. It is a pity that the author drags in from time to time in the form of footnotes his own special political views which are quite irrelevant, for the qualities that make a good works manager (as he admits) are required in every form of industrial government whether now existing or adumbrated in the future.

In the sections "Manners of Management" and "Discipline" that aspect of industrial unrest which finds its expression in the demand for "democratic control of industry" is admirably discussed. The efficient works manager must understand and sympathise with the growing self-consciousness of purpose which is the most notable characteristic of the labour world of to-day. It can never be too sufficiently emphasised that in the successful reconstruction of industry management needs a new spirit even more than new methods. In the democratic modern industry now in process of evolution management becomes government with the consent of the governed. In this development the workshop committee is destined to play an important part, and Mr. Webb deals excellently with this subject. He holds that the management should not be represented on workshop committees. In practice it is usually found that some member of the management is needed to act as "liaison officer." He rightly urges that even where the committees are comparatively ineffective, as for a time they are bound to be, the reference of innovations, welfare arrangements and the like, to the committees secures "the valuable consciousness of consent without which the highest efficiency is impossible."

The most comprehensive section of the book is devoted to "Payment by Results"—not altogether an unbiassed treatment—the underlying theme being that piece rates must never be cut. The grievance of cut piece rates has been largely used as a tactical reply to the complaints of "ca' canny," and there has been much exaggeration on both sides. In view of the importance of this subject in the "restoration of trade union conditions" after the war, apart altogether from more permanent considerations, it behoves every management to systematise and codify its piece rates and bonus rates once and for all. Mr. Webb makes various interesting suggestions for new departures in this direction. The main cause of piece work difficulties in the past has been haphazard fixing of standards. "Scientific management" (which incidentally receives more sympathetic treatment than might have been expected) has shown us that fixing a rate is a complex and difficult operation, and that it requires trained observers for the collection of data and scientific methods for their collation. Piece and bonus rates worked out on these lines and agreed with the workers' representatives, in full view of the facts and figures, constitute methods of valuation of effort which seem designed adequately to meet the innate variation in skill and endurance of individual workers. Such systems scientifically devised and wisely administered cannot fail to increase output enormously, and continuous increase of output (always with due consideration of the human sacrifices involved) is defined by Mr. Webb as the primary concern of the efficient works manager of to-day.

E. Walls.

CELLULOSE. *An outline of the chemistry of the structural elements of plants. By* CROSS *and* BEVAN. *New Impression with a supplement. Pp. 340. (London: Longmans, Green and Co., 1918.) Price 14s. net.*

It is rather difficult to say anything new in a review of a book which first saw the light nearly a quarter of a century ago. Cross and Bevan's "Cellulose" has been for that length of time the only standard English work of reference on that subject and for most of the time the only comprehensive monograph in any language. For the very reason of the extreme importance and value of this book, it is much to be regretted that the authors have not seen their way to re-cast the old matter and re-write the entire work in a lucid and coordinated manner, giving to each aspect of the subject the degree of importance justified by its up-to-date perspective. The time was ripe for a really constructive and carefully designed treatise on cellulose chemistry with the theoretical aspect all the time in the foreground, giving a connected and reasoned survey of the mass of experimental information accumulated around this very enticing subject. For such a work no one is better qualified than the authors; their reputation for insight, knowledge and experience in cellulose matters is fully recognised. Compared with such a treatise as they could write, Schwalbe's monograph would rank merely as a conscientious but uninspired catalogue of facts, important and unimportant, without a leading motive. Judged as a literary effort, Cross and Bevan's "Cellulose" has never been a conspicuous success. Critics of former editions have repeatedly pointed out that the language is difficult, the style is super-learned and obscure, and the subject matter is disconnected. With some of this matter incorporated in the preface, a supplementary chapter, two appendices, a chapter on "Experimental and Applied" which reads as an afterthought to the main scheme of the book, three supplementary volumes of "Researches," to say nothing of an index so inadequate as to be beneath derision, the reviewer can hardly be accused of unfairness if he describes the present position as chaotic.

It is only just to say that in their preface the authors recognise this difficulty and disclaim any ambitious purpose. They publish this series of notes, criticisms and suggestions of theoretical extensions for what they are worth to those who understand and study them with a sympathetic mind. Even those who cannot travel so fast along the various lines of speculative thought adumbrated by the authors, cannot refuse to do homage to the constructive spirit in which these difficult theoretical problems are handled.

The supplementary chapter, which represents the additional matter embodied in this new impression, contains a reference to some important researches by the authors illustrating the extreme sensitiveness of the reactive hydroxyls in passing from raw cotton to the bleached and purified "normal" cellulose. A perceptible chemical modification is produced even by boiling the raw cotton with water and, *a fortiori*, by the scouring treatments of the industrial bleaching process. The same chapter contains a *résumé* of the researches of C. Dorée on the action of ozone on cotton and lignocellulose and on the formation and properties of caramelan. In the section on physical properties the potential theoretical importance of this line of investigation is emphasised. Particular mention is made of recent investigations on the graduated osmotic permeability, variable at will, of nitrocellulose films and the correlated phenomena of pervaporation and percrystallisation which are destined to throw new light on the minute structure of macroscopically continuous colloids. J. F. BRIGGS.

PERSONALIA.

Professor H. C. H. Carpenter has been nominated for a second term of office as president of the Institute of Metals for 1918-19.

Dr. H. H. Hodgson has been appointed head of the department of coal tar colour chemistry at the Huddersfield Technical College.

Mr. S. H. Stroud, formerly demonstrator in the School of Pharmacy, London, has been appointed lecturer in pharmacy and chemistry in the University of Sydney, N.S.W.

Mr. F. V. Darbishire has taken up the appointment of research chemist at the Royal Horticultural Society's Gardens at Wisley, Surrey. His first work will be to investigate the food value of different varieties of beans and potatoes.

The death is reported of Dr. J. H. Ling, professor of chemistry at the North-Western University Medical School, Chicago, a former president of the American Chemical Society.

The death is announced of Sir Ratan Tata, the son of Mr. J. N. Tata, the well-known capitalist of Bombay, the founder of the Indian Institute of Research at Mysore, of the great iron and steel works at Sakchi, and of the Tata Hydro-Electric Works which supply Bombay with electric power. Mr. Tata died in 1904, and the realisation of his schemes fell to his two sons, Sir Dorab and Sir Ratan Tata.

We regret to announce that Colonel Bertram Hopkinson, professor of mechanism and applied mechanics at Cambridge University since 1903, was killed in a flying accident on August 26 last. As head of the Cambridge School of Engineering, Prof. Hopkinson did much to promote its prosperity, and his name is linked with many important researches, including that on gaseous explosions and their bearing on the working of internal combustion engines. Latterly he investigated the pressure produced by the detonation of high explosives and by the impact of bullets.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor*.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.* [*Telephone: London Wall, No. 2429. Telegraphic Address: Induchem, Finsquare, London.*]

RESEARCH IN INDUSTRIAL CHEMISTRY.

It is generally agreed that the industrial future of this country depends largely on the more thorough application of chemical science to factory practice, but there are differences of opinion as to the proper training of the young chemist, and as to the means by which the scientific knowledge and research experience acquired in the college or university laboratory can be brought to bear most directly and most fruitfully on the problems of the chemical and allied industries. At the present time, however, there is a recognition, both in industrial and academic circles, of the valuable services which pure chemistry and chemical industry can render to each other, and the disposition to co-operate has never been more prominent than now. In these circumstances, any scheme which promises to reduce the generally prevailing sentiment to practical propositions is bound to receive the most sympathetic consideration.

The most notable large-scale attempt to strengthen the bonds between science and industry in the national interest is embodied in the operations of the Department of Scientific and Industrial Research. In promoting the formation of Trade Research Associations, and in initiating research on problems of general national importance, the Department has done excellent work, and, provided the purely official element in its administration is reduced to the absolutely necessary minimum, British industry should benefit enormously from this organisation.

The important scheme recently launched by the Salters' Company is designed to increase the existing facilities for research and technical training in chemistry, and to assist manufacturers in securing competent chemists for the investigation of industrial problems. With this object in view, it is proposed to found an institute to be called "The Salters' Institute of Industrial Chemistry," and doubtless a considerable sum of money will be made available for the purposes of the Institute.

There is apparently no intention to build laboratories, and the Director of the Institute is expected, not to initiate research work himself, but to act as a sort of clearing house, by means of which manufacturers, students, and universities may be brought into touch with one another. The Salters' Company proposes to appoint as Director a man with exceptional knowledge of scientific and industrial chemistry, who will establish relations with the universities and technical institutions, as well as with the various branches of the chemical trade. As stated by the Company, the principal duties of the Director will be:—

(*a*) To make arrangements with universities and institutions to enable students to obtain facilities for research and technical training.

(*b*) To arrange between manufacturers and students and universities for the investigation of any particular problems requiring research.

(*c*) To give practical advice and information to those who are or intend to become industrial chemists, and especially to men whose careers have been interrupted or affected by naval, military, or national service.

(*d*) To advise the Company generally as to the progress and any possible extension of the work of the Institute.

The precise meaning of (*a*) is not quite clear, but if it is the intention of the Salters' Company to provide special apparatus and equipment in universities and technical institutions which would otherwise be unable, on financial grounds, to afford these facilities, the purpose is a wholly laudable one. In pursuing the objects specified in (*b*) above, the Institute will be liable to encroach on the field already occupied to some extent by the Department of Scientific and Industrial Research, but there is still much to be done in securing a closer rapprochement between the *individual* manufacturer and the academic chemist. If the Director of the Institute can devise ways and means of attaining this end he will do a good work, but for success it is clear that infinite tact, as well as exceptional knowledge and experience, will be required.

It is further the intention of the Salters' Company to make grants in aid of training, and also to found two types of post-graduate fellowships, *viz.*:—

(*a*) Fellowships to enable post-graduate students to continue their studies at an approved university or other institution under the general supervision of the Director.

(*b*) Industrial Fellowships to enable suitably equipped chemists to carry on research for any particular manufacturer, under an agreement which will be entered into between the Institute, the manufacturer, and the Fellow.

The institution of Fellowships for post-graduate research is to be cordially welcomed. They will be of the greatest service to those numerous chemical students who would benefit from the opportunity of research training, but at present are compelled, for financial reasons, to take up remunerative work immediately after graduation.

In regard to the industrial Fellowships, it is not clear if manufacturers will be asked to pay for services rendered. There is, we believe, a consensus of opinion that at least a portion of such expenses should be defrayed by those who call in the aid of the trained worker. While this and some other points stand in need of further elucidation, there is no denying the generous and large-minded spirit in which the Salters' Company has framed its proposals, and it is to be hoped that the scheme will make a distinct contribution to the consolidation and extension of British chemical industry.

MONAZITE.*

SYDNEY J. JOHNSTONE
(Scientific and Technical Department, Imperial Institute).

The mineral monazite is the source of thoria and ceria, the rare earths composing the luminous portion of the incandescent gas mantle. When it is stated that the normal consumption of gas mantles in the United Kingdom amounts to between 60 and 100 millions per annum, the importance to this country of an adequate supply of the mineral is at once realised.

Monazite is a mixture of the phosphates of cerium, lanthanum, thorium, didymium, yttrium, etc. It is most commonly found as a constituent of beach sands resulting from the partial decomposition of certain pegmatitic rocks. It may vary in colour from pale yellow through brownish red to nearly black, and have a specific gravity of 4·7—5·2. It is valued chiefly on account of its content of thoria, which varies from mere traces up to 30 per cent.

Almost the whole of the demand for thorium is met by monazite sand, but occasionally small parcels of other thorium minerals come into the market. Amongst these may be mentioned thorianite and thorite.

* Based on a lecture entitled "The Rarer Key Minerals," given at the London School of Economics, November, 1917.

Thorianite was discovered in Ceylon in 1904 in the refuse from gem washings near Belangoda, and was first supposed to be pitchblende. An examination made at the Imperial Institute showed that it contained a very large quantity of thoria, and was a new mineral. Thorianite, which contains from 60 to 80 per cent. thoria and up to 30 per cent. uranium oxide, occurs in small black cubes of sp. gr. about 9·3. In 1905, about 9 tons of the mineral was produced in Ceylon and sold at prices up to £1700 per ton. An active search for further deposits has since been carried out by the officers of the Ceylon Mineral Survey, which is being conducted under the auspices of the Imperial Institute, but, so far, no large deposits have been located. Isolated specimens of the mineral have been found in Madagascar, Russia and Japan.

Thorite is a silicate of thorium containing about 65 per cent. of thoria. It occurs in and has been exported from Norway and Ceylon, but owing to the small quantity available, it is not an important thorium mineral.

Deposits of monazite sand have been worked on the coast of Brazil, in the States of Bahia, Espirito Santo and Rio de Janeiro, in North and South Carolina, U.S.A., and in Travancore, India.

Until the rare earth gas mantle was invented by Welsbach in 1886, there was practically no demand for the mineral monazite, the small quantity required being obtained at a high price from certain deposits in Norway and Sweden. In 1893, when the incandescent mantle became a commercial success, the demand for thorium exceeded the supply. About this time, Mr. John Gordon found deposits of monazite sand, which had been concentrated by tidal action, in the beach sands near Prado in the State of Bahia, Brazil, and shipped large quantities to Hamburg. It is reported that, for some time, much was obtained free, being shipped as ballast and landed in Germany at a cost of less than £3 per ton (the sand then selling at about £19 to £24 per ton). In 1903, however, the Brazilian Government discovered the real value of the mineral and invoked an old law by which all the Brazilian coastal lands to a depth of 35 yards above high tide mark belong to the Federal Government "for defence purposes." On these grounds they decided that their consent was necessary before any portion of these lands could be worked for monazite. The Brazilian Government then offered to lease the coastal deposits of Espirito Santo to the highest bidder, and the rights to work most of the deposits were secured by a Hamburg firm which guaranteed to pay a royalty of 50 per cent. *ad valorem* on an annual production of 1700 tons. This company and Gordon agreed to sell all their product to the German Thorium Syndicate which was engaged in making the thorium nitrate required for the manufacture of incandescent mantles. Thus, the German manufacturers, for a time, held the monopoly of the raw material, but later monazite sand deposits were found in other parts of Brazil and in the States of North and South Carolina, U.S.A. This made supplies available for thorium manufacturers not in the German ring and it looked as though an open market might be established in thorium nitrate. To prevent this the German syndicate decided in January, 1906, to drive its competitors from the market by lowering the price of thorium nitrate from 43 to 27 shillings per kilo., and stipulating that the quantity to be sold to each customer should not exceed his usual demand, thus checking the accumulation of reserves. The decrease in price caused the working of the deposits in North and South Carolina to become unremunerative, and since that date the market has been largely controlled by the joint action of German and Austrian monazite producers and thorium nitrate manufacturers. It must be mentioned, however, that a small quantity of thorium nitrate has been made in France for some years past from Brazilian monazite.

Brazil.—The monazite occurrences may be roughly divided into three groups: (1) Deposits lying along the shore (Marinhas) claimed by the Federal Government. (2) Deposits on private land situated immediately behind the Marinhas. (3) Inland deposits.

The greater proportion of the monazite exported from Brazil during recent years has been obtained from the first variety of deposits situated in the States of Espirito Santo and Bahia. When first exported the crude sand was sufficiently valuable to permit of direct shipment, but, in later years, owing to a falling off in grade, preliminary concentration has been rendered necessary. The working of the second type of deposit has presented several difficulties, amongst which may be mentioned the uncertainty in fixing the extent of the Marinhas, which extend 35 yards inland from mean high water mark. The inland deposits are in the interior of Brazil, and only those occurring in small streams and bottom lands are of commercial importance. The content of monazite in the gravels of these streams, etc., averages about 0·3 per cent. (about the same quantity as is found in the Carolinas). The working of the inland deposits is expensive owing to the high cost of transport to a port of shipment. The Brazilian deposits were vigorously worked by the German syndicate up to 1910, when another potential producer came into the market.

The following table shows the destination and quantity of the monazite sand concentrates exported from Brazil during recent years so far as figures are available:—

Destination	1911 Tons	1912 Tons	1913 Tons	1914 Tons
Germany	1,860	1,823	251	—
France	1,078	928	766	—
United States ...	689	590	394	590
Great Britain ...	—	1	3	—

India.—In 1909, the representative of an English registered mining company had discovered rich deposits of monazite on the seacoast of Travancore, Southern India, which were found to contain monazite nearly twice as rich in thoria as the pure Brazilian mineral. A concession was obtained in Travancore, and it is stated that attempts were made in the United Kingdom to obtain the additional capital required for working the deposits, but without success. Recourse was therefore made to foreign financiers, and a certain German company supplied the required capital but did not appear in the transaction. The whole of the output of monazite was sold to Germany, and this continued up to the outbreak of war. This arrangement was highly profitable to all concerned, as the royalties and production costs of the Travancore sand were considerably lower than those of the Brazilian material containing only half the amount of thoria.

An official investigation was made shortly after the outbreak of war, with the result that enemy interests in the company were eliminated, German contracts cancelled, and the company so reconstituted that in future the control must remain in the hands of British born subjects. An important clause in the undertaking accepted by the shareholders stipulates that the company must be ready at any time to sell monazite at a fair price to British firms who wish to purchase the material for the purpose of manufacture.

The Travancore deposits as worked from 1910—1914 occur on the sea shore, chiefly to the north of Quilon, monazite having been found over a total area of 1427 acres. A rough calculation by

Mr. I. C. Chacko places the probable amount of monazite available at about 1,776,000 tons. This is based on the assumption that the crude sand contains 10 per cent. of monazite and exists to an average depth of 2 feet, although in many places the depth is nearer 20 feet. In addition to the original company operating the deposits (the Travancore Minerals Co., Ltd.) a lease has been granted to Messrs. Hopkin and Williams, Ltd. (Travancore), to work 150 acres for a period of 20 years. During 1916-17 a large proportion of the Travancore output was sold to the United States.

Monazite sand has been found in several other localities in India, but not in commercial quantities.

Ceylon.—During the past ten years, a considerable amount of work has been carried out under the auspices of the Imperial Institute on the occurrence and distribution of thorium minerals in Ceylon.* As a result monazite has been found in many localities and a beach deposit is about to be worked, concentrating machinery having been exported from the United Kingdom. As a general rule, Ceylon monazite, when pure, contains about 10 per cent. of thoria, but occasionally samples carrying as much as 30 per cent. are found.

Monazite is known to occur in many parts of the British Empire, but the only deposits at present worked are those of Travancore and Ceylon.

Africa.—Numerous analyses of monazite from Nyasaland and Nigeria have been made at the Imperial Institute.† The percentages of thoria found in the pure monazites from these localities were :—Nigeria 2·3—8·0, Nyasaland 7·1.

Union of South Africa.—The mineral has been reported to occur in several localities, but the content of thoria present is usually below 3 per cent. thus making the mineral unsaleable. At a mine about 60 miles north-east of Pretoria, much monazite carrying 3·5 to 4·5 per cent. of thoria is said to occur in the dumps. Monazite carrying 6·5 to 7·0 per cent. of thoria has been discovered in alluvial tin deposits at Embabaan, in Swaziland.

Australia.—Monazite has been found in certain parts of Australia, and is a frequent associate of the tin and tungsten deposits of New England, New South Wales. The percentage of thoria present in the pure monazite, as shown by the following figures, is in most cases too small to repay working, even if adequate supplies of the mineral were available :—Vegetable Creek district, 1·23; Battery Mountain, Deepwater, 0·77; Black Swamp, 4·12; Torrington, 0·38; The Gulf, Emmaville, 0·35.

Federated Malay States.—Monazite has been discovered in a number of localities, chiefly associated with alluvial tin,‡ in Kedah, Kelantan, Pahang, etc. So far the quantity found has not been sufficient to render its recovery and separation a commercial proposition. The thoria content of a number of specimens examined at the Imperial Institute has varied between 3·4 and 9·4 per cent.§

United States.—At one time the monazite deposits in North and South Carolina were important sources of the mineral, but during recent years the low price of thorium nitrate has rendered their working unprofitable in competition with the richer coastal deposits of Brazil and Travancore. Only a nominal output was made from 1907 to 1911, and since that period it has been negligible. The deposits, which are patchy, occur below the soil and contain up to 0·25 per cent. of monazite.* A small production from Idaho was recorded from 1907 to 1912, when the output ceased. It has been stated that the recent production of monazite in the United States has been obtained from beach sand deposits near the mouth of the St. John's River, on the east coast of Florida.

* See Bull. Imp. Inst. 1916, 14, 321.

† See this J., 1914, 33, 56.

‡ Bull. Imp. Inst., 1906, 4, 309, and 1913, 11, 243.

§ This J., 1914, 33, 56.

Treatment of the crude sand before export.—The crude sand may contain from 0·2 to 60 per cent. of monazite, but the material to be saleable in Europe must contain at least 4 per cent. of thoria. It is evident, therefore, that the Brazilian material must be concentrated so as to contain at least 70 per cent. of pure monazite. As a matter of fact, it has become customary to dress both the Brazilian and Travancore sand to a purity of 85 or 90 per cent. Most of the minerals which occur in the sand with monazite, *e.g.*, quartz, garnet, rutile, magnetite, ilmenite, zircon, etc., have a much lower specific gravity, and so a preliminary concentration can be effected by sluicing. The final separation of the monazite from minerals of nearly the same specific gravity is usually effected by means of either an electro-magnetic separator or air concentration.

The world's production of monazite sand concentrates during recent years is shown in the following table :—

World's production of monazite sand.

		Brazil		United States		Travancore*	
		Quantity Tons	Value £	Quantity Tons	Value £	Quantity Tons	Value £
1909	..	6,359	144,742	242	13.548	Nil	—
1910	..	5,345	127,526	44·3	2,501	Nil	—
1911	..	3,627	111,104	1·1	89	819	24,044
1912	..	3,344	108,758	0·5	33	1,135	41,419
1913	..	1,415	38,415	Nil	—	1,234	42,012
1914	..	590	16,285	Nil	—	1,185	41,411
1915	..	433	7,441	18	—	1,108	32,238
1916	..	Nil	—	19	—	1,292	37,714
1917	..	1,118	27,829	—	—	597	—

* Monazite exported.

Thus in 1915 India produced 73 per cent. of the world's output of monazite and 90 per cent. of the total thorium production.

The thorium nitrate market.—Shortly before the outbreak of war the position of the British makers of incandescent mantles became serious in regard to their future supplies of thorium nitrate. The German makers of the salt by virtue of their association with the syndicate of monazite producers had control of the entire output of monazite from the Travancore deposits and of a very large proportion of the Brazilian mineral. Thus it became possible for them to decree how much thorium nitrate the British incandescent mantle manufacturers were to be allowed per annum, the supply being granted on condition that they undertook to purchase solely from the syndicate for a period of years. This condition of affairs would probably have prevented any expansion of the British incandescent mantle industry except by German permission and would have discouraged any British chemical manufacturers from attempting to make thorium nitrate on a large scale as the free market would be very restricted. The majority of incandescent mantle makers had to agree to this arrangement, but a small number were able to make contracts with certain French firms who had obtained control of the output of a portion of the Brazilian deposits. At that time, practically, no thorium nitrate was being made in the United Kingdom from monazite sand, the only

* According to recent estimates the cost of producing one ton of monazite containing 4½ per cent. of thoria amounts to about £35, or nearly the price at which the equivalent quantity of Travancore concentrated sand, containing twice as much thoria, could be purchased in Hamburg before the war. This cost does not include management charges or freight.

production being from waste mantle ash. The quantity of thorium nitrate obtained from this source probably amounted to about one-fifth of the country's requirements. The outbreak of war upset the German control, and as supplies from Germany ceased the trade found it difficult to get sufficient material to use The price of thorium nitrate rose from about 19*s.* per kilo. to nearly 90*s.* late in 1914. The situation was eased somewhat by imports from France, and later fairly large amounts were obtained from the United States. The supplies, however, were quite inadequate to meet the demand, and the price remained at about three times the pre-war figure. The shortage of thorium nitrate in 1915 caused several of the more important incandescent mantle manufacturers in the United Kingdom to consider the question of producing thorium nitrate for their own requirements, and it is pleasing to record that several have been successful in this respect.*

Mesothorium, a substance having properties very similar to radium, is obtained as a by-product in the manufacture of thorium nitrate. One ton of monazite containing 5 per cent. of thoria will give about 2½ milligrams of mesothorium, worth £9 to £12 per milligram.

Cerium earths.—As already mentioned, thoria constitutes, at the most, only about 9 per cent. of the monazite sand of commerce, the remaining 91 per cent. being made up of ceria and its allied rare earths and phosphoric acid. These cerium earths, which constitute about 60 per cent. of the sand, were for many years a drug on the market, and enormous quantities accumulated at the chemical works where thorium nitrate was made. The only steady consumption for cerium compounds was for use with thorium nitrate in incandescent mantles, but as the mantle contains only 1 per cent. of cerium oxide to 99 per cent. of thorium oxide, this demand was small. For many years chemists searched for a profitable means of utilising this waste, and many uses were suggested, such as for colouring glass yellow, as a mordant in leather dyeing, cure for sea-sickness,† electric lamp filament, and colouring porcelain. It was not until 1903 that a use was found which called for any considerable quantity of these waste oxides. In that year, Welsbach discovered that if these oxides were reduced to the metallic state the resultant metal, when filed, gave off a bright shower of sparks sufficient to ignite an inflammable gas. The sparking properties, however, were not permanent, being confined to the surface layer of the metal.

Welsbach disposed of his original patent for making the alloy for £30,000 to a company which monopolised the market for a number of years, but later the patent was disputed and its operation was limited.

Subsequently, it was found that better results were obtained when the mixture of metals was alloyed with about 35 per cent. of iron. This product, known as ferro-cerium or cerium pyrophoric alloy, constituted the sparking substance in the majority of automatic cigar lighters sold before the war. The quantity of alloy in each lighter is actually small, about 1800 to 2800 of the small cut squares or ovals going to make one pound. Each of the small ovals will give 2000 to 6000 separate ignitions. An alloy of the cerium earth metals with magnesium and aluminium, known as "Kunheim" metal is employed for the same purposes as the ferro-alloy.

Ferro-cerium was made in small quantity in this country by a company of German association from material imported from Germany, and was sold in June 1914 at about 15*s.* per lb. Prior to the outbreak of war it was made almost entirely in Germany and Austria, where its selling price fell to 8*s.* 6*d.* per lb. At the present time, a fairly large amount is being produced in the United States, but the price has now reverted to somewhere about the original figure of £5 16*s.* per lb.

Ferro-cerium has also been used for defining the flight of shells. A small piece of the alloy is affixed to the shell, and a short interval after the latter has left the gun friction with the air causes the alloy to burst into flame and so indicate its flight. It seems very probable that other similar uses are now being found for the alloy.

During the past few years, a considerable quantity of cerium earth salts has been used in the preparation of certain types of electrode used in "flaming" electric arc lamps. It has been stated that the annual consumption for this purpose exceeds 300 tons.

In the unlikely event of the residues from the treatment of Travancore and Ceylon monazite in this country proving insufficient to meet the demand for cerium compounds, the supply could probably be augmented by minerals such as cerite and allanite, which occur in Ceylon.

* See this J., 1916, 811, 1040.

† For a discussion of the numerous minor uses to which the cerium earths may be put see "The Rare Earth Industry" (Crosby Lockwood and Son, 1915).

PAPER TEXTILES IN CENTRAL EUROPE.

The *Board of Trade Journal* for September 12, 1918, contains among its "Special Articles" a broad survey of the paper textile industry which has developed to such a remarkable extent in Germany and Austria as the result of the shortage of natural textile fibres. It is stated that, whereas before the war there were in Germany only two factories making paper yarns, at the end of 1917 there were as many as 250, and in Austria there are now said to be 300. It is difficult to estimate the amount of paper yarn produced in the two countries, but there are reasons for believing that it must be somewhere between 200,000 and 300,000 tons per annum. Such a production, coupled with the heavy demand for wood pulp for explosives, has had a serious effect on the available supply of materials for making printing paper, and strong efforts have been made to supplement the home resources of wood pulp by largely increased importations from Sweden and by exploiting the conquered territory of Russia. In attempting to gauge the present significance and future importance of the paper textile industry, enthusiastic reports of the universal excellence of the material have to be largely discounted; nevertheless a substantial residuum* remains which will have to be taken into account in the world's markets after the war. Paper is not a substitute for wool, at the most it can only serve as a very inferior diluent, and even the Germans put forward no serious claims in this respect. With regard to hemp and flax, the position in Germany and Austria has become considerably easier since the occupation of the flax-producing districts of Russia, and in any case, typha fibre would appear to be a fair temporary substitute for these textile fibres. Strong claims have been put forward for paper, in the form of fine yarns and other manufactured products, as a satisfactory substitute for cotton, with a post-war future. Machine belting, clothing, bags and numerous other articles have been made of paper, and it is suggested that fine textiles suitable for underwear are habitually accepted by the public. Such statements must be regarded sceptically until

supported by proofs and it would appear that no samples of fine textiles which could be regarded in any way as a practicable substitute for cotton have arrived in this country. With regard to jute, on the other hand, the outlook is very different. It is undeniable that very great improvements have been effected in the manufacture of paper textiles as substitutes for jute during the war, and although many of the claims made are extravagant and some of the defects are of a fundamental nature, there is no doubt that these paper textiles have been usefully employed in very large quantities. A certain degree of permanence is therefore to be expected in the competition of paper textiles with jute, at any rate during the period of reconstruction, and it is highly probable that the German Government, backed by the vested interests which are now created, will do all in its power to foster the home industry until it is established on a permanent competitive basis. It must, however, be noted that the German jute manufacturers have strongly stated their preference for the real article, so that questions of price will become the dominating factor. It is impossible to say how far this new material will affect British jute interests both for home consumption and for export. As a war measure, the use of paper textiles does not attract us, but after the war it is possible that the products may be so improved as to become a menace to our established jute trade, especially if freights from India are maintained at a high level for a prolonged period. In that case steps will have to be taken to meet this new competition and to develop the paper textile industry in this country.

LEGAL INTELLIGENCE.

CASES IN THE PATENTS COURT.

On September 18 last, the Comptroller of Patents agreed to recommend the granting of a licence to Messrs. Scott, Greenwood and Son, to publish a revised English translation of the third (1912) German edition of "Toilettenseife," by Dr. C. Deite, of Berlin.

The Pure Russian Liquid Paraffin Co. applied on September 19 for a licence in regard to German patent No. 11,140 of 1908, "Improvements in purifying crude petroleum or petroleum products or distillates," which covered a process for treating oil with sulphur dioxide (see this J., 1918, 230 R). The applicant company, formed in 1915 with a capital of £50,000, had works in Kent and held concessions of oilfields near the Caspian Sea. By using this patent, the great difficulty of obtaining fuming sulphuric acid would be obviated. The granting of the licence was recommended.

An application was made on September 20 by F. J. Shepherd, of East Molesey, for a licence to use German patent No. 2562 of 1913, in the name of Dr. R. Fischer, of Berlin-Steglitz, for the manufacture of sensitised paper and photographic developers which would yield a permanently tinted photographic print. The patentee claimed to be able to render permanent the coloured prints which result from the use of ordinary developers in the absence of sodium sulphite or like reducing agents. This he accomplished by adding substances which coupled with the oxidation products formed during developing. The applicant stated that he had found that the specification worked satisfactorily. The Comptroller said that the licence would be granted on the settlement of royalty terms.

A SYSTEM OF FILING PAPERS, ETC., BY SUBJECT.

H. DROOP RICHMOND.

The system described by M. de Whalley (this J., 1918, 317 R) has the advantage that the papers can be found when wanted, but is unnecessarily complex, entails more work than a filing system need require, and uses up many more guides than are wanted to index the papers efficiently, and is thus at once costly and cumbrous.

The system starts as an alphabetical one, but practically from the beginning the alphabetical arrangement is discarded for a numerical one, and except that the initial letters of the subjects are made to correspond with a regular rotation, the spelling of the name is of not the slightest help in finding the subject. The system depends on hunting up in indexes names entered up at random, and reference to a second sub-index similarly arranged which refers to folders where probably the papers will be numbered, but not arranged alphabetically. It will work for a few papers, but if they run into hundreds such a system would be practically unworkable from the loss of time involved in searching through the indexes.

There is no necessity to use a numerical system at all, and papers should be filed alphabetically, and thus form their own index. A number of metallic tab guides (from 25 to a thousand or more) and a sufficiency of folders is all that is required for a perfect system of filing; the headings of the guides are typed on small cards which are inserted in the metal tabs, and varied to suit the papers filed. In a very small cabinet the headings may be just the letters of the alphabet, but these should be varied so as to include not more than about two dozen folders to each guide; where the subject is capable of sub-division each sub-division may have its own folder, but where papers on any subject are few, an alphabetical arrangement in the folder will enable papers to be found easily: an index may be made on the folder, though this is not as a rule advisable, but cross-references should always be written on the folder. Where a subject has many sub-divisions, for instance if one takes "Tinctures" as the subject, a number of guides may be necessary for this subject alone, and the headings may be abbreviated, as "Tinct. Acon.," "Tinct. Hyos.," "Tinct. Quin.," "Tinct. Strych."

It is quite easy to connect up this alphabetical system with a numerical system (should for instance a reference be required to cards or papers filed under numerical order containing statistical information such as dates, weights, prices, routes) or with references to note books, text books, journals, etc., which cannot conveniently be filed, by appropriate rulings and entries on the folder, such cross-references being arranged, alphabetically, numerically or chronologically according to which method will best facilitate the finding of the necessary information. As an example of the advantages of such a system it is possible if rung up on the telephone about tri-methylene glycol in glycerine, by keeping one's friend waiting a minute or two, to give him references to published work, read out to him the composition of the samples examined, tell him weights, dates, departments using, prices of any consignments for a couple of years past, and refer to any correspondence on the subject, and talk intelligently about plant, markets, manufacturers, etc. I do not think M. de Whalley could do this.

NEWS AND NOTES.

CANADA.

British Columbian Iron for Japan.—Pig iron is now being cast from an electrically operated furnace and is proving a great success. Contracts for 2000 tons of pig iron have been obtained, a portion of the orders being for Japan.

Utilisation of Saskatchewan Lignite.—The recommendations made to the Canadian Dominion Government by the Advisory Council for Scientific and Industrial Research, in connexion with the production of a high-grade domestic fuel from Saskatchewan lignite, have been approved. The Dominion Government has provided a sum of money for the construction and operation of a plant.

Canadian Coal for Hawaii.—A report received by the Department of Trade and Commerce at Ottawa from the Canadian Trade Commissioner at Yokohama states that owing to shortage of cargo space Japan and Australia failed to maintain their coal trade with Hawaii in 1917. "As a result of this famine," states the report, "the Hawaiian Islands turned to Canada for a supply of coal and were able to buy about 50,000 tons." It is reported that nearly all the coal now used in the island is of Canadian origin.

Potash Discovery in Saskatchewan.—Details as to the discovery of the deposit of potash, sodium sulphate and Epsom salts 30 miles north of Maple Creek show that the deposit occurs on the dried-up bed of an old lake, and that there will be no difficulty in extraction. The whole of the lake bed, which is 2½ miles long and one mile wide, has been staked and filed, and work will commence immediately. Professor McLaren, of Saskatchewan University, has examined the minerals and reported favourably. It is suggested that a railway branch be run from Maple Creek to the works.

Flax Cultivation in Alberta.—The President of the Lethbridge (Alberta) Board of Trade estimates that the area now under flax in that district is not less than 2,500,000 acres, and exceeds that of 1917 by 500,000 acres. So numerous were applications from farmers in Western Canada for a share of the 10,000 bushels of fibre flax seed distributed in the Western Provinces that the supply was practically exhausted in one day. The seed was obtained from Serbia, Vladivostok, Japan and Vancouver.

Utilisation of Fish Waste.—The commercial feasibility of using for fertilisers, or as food for live stock, the immense quantities of fish waste now unused in Canada, is suggested in a report issued by the Commission of Conservation. It is estimated that the fish waste in Canada is about 46 per cent. of the catch. In the lobster packing industry, the waste is about 75 per cent. On the great lakes 44 per cent. of the total annual catch is waste. An experimental plant, established at Port Dover on Lake Erie in 1916, demonstrated the practicability of converting such waste into marketable products. Further experiments as to the food values of the fish meal manufactured at this plant are now being carried out at the central experimental farm at Ottawa.

AUSTRALIA.

Cardboard Food Containers.—Prof. Masson, Dr. H. Green, and Mr. G. Ampt, of the Science and Advisory Committee, have found that a condensation product of phenol and formaldehyde, soluble in alcohol, forms a suitable varnish for the cardboard containers used for packing foodstuffs.

GENERAL.

The Chemical Industry Club.—During the past month an important development has taken place which should be of considerable interest to chemists in town and country. The Club is now housed at No. 2, Whitehall Court, Westminster, where, in addition to the usual facilities, sleeping accommodation is also provided for members, and there is a restaurant to which ladies may be invited. We understand from the Hon. Secretary, Mr. H. Edwin Coley, that the membership has been rapidly increasing, and that it now numbers over 350. As the premises are not very large, it will probably be necessary to limit the number of members and to institute a waiting list. The Club is still holding its monthly meetings and other arrangements are being made to keep it a live organisation. It is understood that the income of the Club is more than sufficient to meet its estimated expenditure, so that there is every probability that additional facilities will be provided in the near future. A Club of this kind has long been wanted by chemists, and the new arrangements undoubtedly constitute a step in the right direction, especially as they have been so designed as not to compete in any way with a national organisation which may be formed in the future.

British Association of Chemists.—With the object of forming a Birmingham Local Section of the British Association of Chemists a meeting was held at the University of Birmingham on September 26. Mr. L. P. Wilson (Coventry) presided, and nearly 100 chemists were present. The meeting was addressed by Prof. J. W. Hinchley, who urged the importance of organisation among chemists, particularly in view of industrial reconstruction. Reference was made to the policy and growth of the National Association of Industrial Chemists by Mr. Blackwell, the Birmingham Hon. Secretary, who stated that the final issues of recent conferences between representatives of the Association and Government officials would shortly be published. The chairman said the Institute of Chemistry was essentially a qualifying body; the National Association was not. His hope was that the B.A.C. would later on improve its qualifications on the lines of the Institute. He thought all three organisations had a function to serve on behalf of the profession of chemistry. A resolution was passed forming a Birmingham section of the B.A.C. and appointing a local committee.

A New Source of Sulphuric Acid and Cement.—Investigations recently carried out in Germany have resulted in the establishment of a works for the manufacture of sulphuric acid and cement from gypsum by heating the latter with clay in a cement kiln. The products are a compound of the calcium in the gypsum with the silica and alumina in the clay, and sulphur dioxide which is converted in the usual manner by catalysis into sulphuric acid (*Tonindustrie-Zeit.*, Sept. 3, 1918). The process has an interest apart from the normal production of sulphuric acid, inasmuch as there are several sources of waste material which are rich in gypsum, plaster of Paris, and other forms of calcium sulphate yet cannot be made into plaster by the ordinary method of manufacture, and so are of little or no commercial value. For example, the old and broken moulds used in the Potteries form large heaps around certain works and are quite useless because of the salts and absorbed clay present. If the new process is applicable on a moderate scale, it might prove to be an excellent means of ridding potteries and certain other works of an accumulation of material which is a source of expense and inconvenience. It would, of course, be necessary to investigate the matter fully from

this special point of view before undertaking the utilisation of waste gypsum and similar materials on a large scale.

Boring for Oil in Derbyshire.—Preparations are being made for boring for oil in the Chesterfield district. All the necessary machinery, as well as the skilled labour, has been brought over from the United States to avoid delay. The engineers and experts who have arrived at Chesterfield have had extensive experience in the Mexican and other oil-fields. According to one of these, oil is most likely to be found at about 2000 ft., but preparations are being made for sinking the bore holes to twice that depth. The boring will be in the anticlinal, extending from Halfway to Pilsley and passing through Brimington Common.

Preparations are also being made to prospect for oil in the Codnor Park and Pye Bridge districts. The little hamlet of Pye Bridge is the locality where the first stream of oil was discovered in 1847 in a small coal pit, long since closed. The stream produced about 300 gallons daily, and then ran dry.—(*Coll. Guard., Sept.* 27, 1918.)

Irish Lignite Supply to be Utilised.—As a sequel to the tour of inspection made in the counties of Antrim, Armagh, Tyrone, Derry, Carlow and other places in the north and south of Ireland by Mr. E. Bath, consulting engineer to the Government of Canada and to the French and Italian Governments, the lignite deposits near Portrush, Co. Antrim, and various coal deposits in Carlow and Tyrone are to be developed without delay. The Tyrone coal is a good steam coal, and was formerly extensively used as such. A plant which is being installed at Lough Neagh (Ulster) will produce between 15,000 and 20,000 tons of fuel per week, and the plant at Portrush will give 3000 tons per week. Boring operations are planned.—(*Coll. Guard., Sept.* 6, 1918.)

Coal and Iron in Ireland.—At a meeting of the Irish Sub-Committee of the Parliamentary Committee on Irish Transport, held in Dublin, it was stated that the minerals in the Arigna Valley to the west of Lough Allen are now being exploited. Coal, iron ore, fireclay and flagstones are being worked, principally the first and last. A railway is being constructed to connect the mines with the Cavan and Leitrim Railway, and it is hoped that the waterways of the Shannon will also be used. The output of coal has increased from 82 to 120 tons per day, and there will be a further increase when the connecting railway is completed. It is estimated that there is 18,000,000 to 20,000,000 tons in the locality.—(*Coll. Guard., Sept.* 20, 1918.)

Steam Power Economies.—Four hundred experts have been appointed by the Coal Controller to consult with and advise steam-power users how to eliminate waste. There are 45,000 users of steam plant in Great Britain. Up to the present reports on 364 firms have been carefully scrutinised, and it is estimated that a saving of approximately 106,000 tons could be effected by paying attention to the following considerations: Obtaining greater efficiency in the combustion of fuel; education of stokers; utilising the heat in the gases to better advantage; using exhaust steam for heating feed water; adjusting engines to use more efficiently the steam generated; using the hot water from the condenser discharge instead of cold water for boiler feed purposes; effective lagging of steam pipes; disconnecting steam pipes not in use, etc.—(*Bd. of Trade J., Sep.* 26, 1918.)

Monazite in Burma.—The Geological Survey of India reports that an analysis made of the monazite sands of Mergui and Tavoy, in Tenasserim, Lower Burma, taken from 28 locations, shows but 0·18 per cent. of thoria in the heavy concentrates, equivalent to 0·00216 lb. ThO_2 per cubic yard of the ground sampled, and adds: "Such a minute fraction is of course of no practical utility."—(*U.S. Com. Rep., July* 22, 1918.)

The Development of Empire Resources.—At a recent meeting of the Executive Council of the Imperial Institute, information was submitted concerning investigations of new or little known raw materials which have been brought into prominence by the war.

In connexion with the present shortage of paper, mainly due to lack of tonnage, the Institute has lately examined grasses from S. Africa, the Federated Malay States, Australia and St. Helena. Samples of "Tambookie" grass from Pretoria gave a high yield of pulp of good quality. Lalang grass, a waste weed growing in the Malay Peninsula, compared favourably with Algerian esparto, although not so good as Spanish esparto, while bamboo grass from the Northern Territory of Australia came up to about the same standard. All these grasses could be used locally for pulp or paper manufacture.

There would be a market for Indian beeswax in Russia for making church candles were it not for the wide prevalence of adulteration. Of forty samples examined at the Institute, only four could be stated to be unadulterated. Experiments are in progress with the view of establishing recognised standards for the Indian product.

The shortage of shipping has stimulated interest in the suitability of local clays in various colonies for the manufacture of bricks and tiles, etc., to replace galvanised iron. The Institute has given special assistance in this respect to the authorities in Northern Nigeria.—(*Bd. of Trade J., Sep.* 5, 1918.)

Development of Raw Materials in British India.—Various State Government Departments in India are seeking to utilise and develop native raw materials. The Government of the United Provinces has recently sanctioned a scheme for the training of apprentices in glass-blowing at the United Provinces Glass Works, Bijhoi, Dt. Moradabad. The Government has also approved of grants for experiments in tannin and dye extracts and of a loan to the proprietor of the Ramnagar Cutch Factory. An advisory committee has been appointed in connexion with the Leather Working School, Cawnpore. The supply of tanning bark for 1918 in most districts is better than was anticipated. In the Settlement Departments, the Government is arranging for giving out lands for the cultivation of avarum bark on very easy terms, and it is hoped that interested parties will take to avarum cultivation instead of depending solely on the wild-grown bark. If the tanning industry is to develop, or even to maintain itself as an Industry, tanners will have to depend more and more on cultivated bark. Resin and turpentine obtained from the *Salai* tree have been reported upon favourably, and the possibility of making the gum derived from the tree suitable for commercial mucilage is under consideration. The tree is abundant in the Satpuras and is favourably situated for exploitation. Experiments have been made in the Belgaum District in the production of charcoal, but the only hope for this industry lies in resort to dry distillation. Blocks of teak and jamba are proving to be excellent paving material for streets, and the use of matti wood for railway sleepers is still under investigation.—(*Bd. of Trade J., Sep.* 5, 1918.)

Proposed Regulation of Potash Mines in Spain.—The production of potash in Spain is to be under stringent Government control; the Government will regulate the manufacture and sale of fertilisers, and in case of war will take over the deposits for as long as necessary. The State is also empowered

to control the production of all minerals of national importance, especially those necessary to agriculture, and will undertake a survey of deposits in Barcelona and Lérida.—(*U.S. Com. Rep., July* 11, 1918.)

Tanning Materials in Germany.—The German Government, according to the German leather trade press, is offering prizes of 20,000 and 5000 marks for the solution of the following three problems:—

(1) The provision of substitutes for cod oil and other fish oils in the currying and dressing of leather, as these oils are almost unobtainable. (2) A substitute for chrome salts for the production of leather of the nature of chrome-tanned leather; also a substitute for the production of leather by means of other mineral salts, or mineral salts combined with vegetable material which will produce a leather similar to combination tanned leather. (3) A method that can be used during the war and that will result in a saving of vegetable tanning material without affecting the quality of the leather so produced. The judges are the Secretary of State von Moller, Prof. Emil Fischer, Dr. Fahrion, oil chemist, Prof. Paeßler, a leather trades chemist, and five large tanners.

The offer of these prizes is believed to be a clear indication that Germans are suffering from a lack of fish oils and grease for stuffing leather, and from a shortage of chrome salts and of vegetable tanning materials.

The German requirement in tanning materials for the leather industry amounted before the war to 80,000 tons per annum, 66,000 tons of which were obtained from abroad. The imported foreign materials contained 40 per cent. of tanning substances, as against 10 per cent. yielded by native oak and pine bark, and were cheaper, but they were unable to displace entirely the German materials, as the light brown shade preferred for leather is only obtainable from tanning stuffs of oak bark. As a consequence mixtures of foreign materials with oak and pine bark were used. The war necessitated dependence solely on German materials, so that it has been necessary to seek further sources of supply. Prof. Pässler, of the German Research Institute for the Leather Industry at Freiberg in Saxony, has drawn attention to the importance for the tanning industry of the Spanish chestnut, which grows extensively in Alsace-Lorraine, the Rhenish Palatinate, Baden, and Hesse, and has not been at all fully exploited for the purpose in Germany. As a result of experiments now completed he has ascertained that both the bark and the wood of the Spanish chestnut contain on an average 10 per cent. of tanning substance, *i.e.*, as much as the oak, and as its conditions of growth are more favourable, he proposes that a part of the South German oakwoods should be replaced by Spanish chestnut plantations, a proposal which meets with approval in forestry circles also.—(*Hamburgischer Correspondent.*) [*Bd. of Trade J., Sep.* 19, 26, 1918.]

Means for Lessening Risk of Colliery Explosions.—Experiments to ascertain the effects of reduced atmospheric pressure in promoting the emission of fire-damp from coal, reported by Dr. L. Tübben, of Charlottenburg, have given an effective means of protection against colliery explosions. Similar experiments have been made before, but with less definite results. By reducing the atmospheric pressure in a mine, or a part of the workings—which can be done readily by means of the ventilating fan—much fire-damp may be drawn from the coal, so that for a time after restoring the full pressure the emission of gas is diminished and fiery workings rendered safer during that period.—(*Glückauf, July* 20, 1918.)

The Baku Oilfields.—Recent statistics of production of petroleum from these fields give, in millions of poods:—1913, 467; 1914, 424·4; 1916, 476·5; 1917, 402·5 (pood=36 lb.). The proportion of oil from the new fields shows a steady increase:—1906, 0·17%; 1907, 2%; 1913, 16·7%; 1916, 30·95%. The reduction in total yield for 1917 was due to diminished activity in boring.—(*Z. angew. Chem., June* 21, 1918.)

The French Oil-seed Industry.—The future position of the oil-seed industry demands attention in view of the anticipated reduced importation of raw materials from British possessions, for Great Britain will probably take for herself a considerable part of the supplies that formerly came to France. Of the total importation of oil-seeds into France, the French colonies contribute only about 25 per cent.

It is thought that the present supply of arachis nuts from French West Africa might be considerably increased; and it is hoped that the export of sesame seeds from India and China to the Central Powers may be diverted to France. The maintenance of the pre-war supplies of palm oil and palm kernel oil is assured, since the imports and exports of the former were approximately equal, and the exports of the latter exceeded the imports by some 32,000 tons. By extending this cultivation and improving oil-extracting plant, the future of the French edible oil industry might be secured.

The cutting off of the comparatively small supply of copra from British possessions would be of little moment, but the probable diversion of the Philippine supply to meet the increasing consumption of the United States is a matter for serious apprehension. Little of the enormous Dutch-Indian supply is likely to find its way into France after the war, as the Central Empires, and probably also Belgium, Sweden, Denmark, Russia, etc., will appear as buyers in this market. The present intensive cultivation in Cochin-China, Dahomey, and French Guinea will hardly result in meeting more than one-fifth of the actual demand.

In spite of the home supply of linseed, France imported annually before the war more than 100,000 tons of seed from the Argentine, India, Russia and the Levant. An extension of the area under cultivation in France of this and other seeds capable of flourishing on French soil, such as rapeseed and poppyseed, is unlikely to be taken in hand in view of the more urgent claims for increased production of other crops. A certain measure of relief may be found in Tunisia, which exported 13,000 tons in 1915.

The necessity of importing castor seeds from India might be obviated by introducing good seed into French Indo-China, Madagascar and Africa, and by improving indigenous varieties: and it is, in fact, intended to carry out this proposal. The increasing demands of the textile industry will lead to extended cultivation of cotton in the French colonies, thus ensuring an increased supply of cotton seed and tending to render France independent of the Indian supply. The small supply of Indian mowrah seed may be still further diminished, as Great Britain has recognised its value in the manufacture of chocolate; but this eventuality would be beneficial if it led to the exploitation of the many oil-seeds, such as karité, owala, etc., which grow in French West and Equatorial Africa. —(*Chem. et Ind., Aug.*, 1918.)

The Oil and Fat Industry at Marseilles.—The average annual import of oil-seeds before the war was 560,000 tons. In 1910 the importation was at a maximum with 665,679 tons; for the years 1914, 1915, 1916, it was 605,474, 516,277, and 453,583 tons respectively. Of the 1916 importation, 224,087 tons represented groundnuts and 105,763 tons copra.

The average production of fats was 200,000 tons, of cattle cake 234,000 tons. The 1916 production did not satisfy the requirements of the country, hence olive oil was imported from Spain and cottonseed oil (25,000 tons) from America.—(*Z. angew. Chem., July* 16, 1918.)

Hydro-electric Power in the Canton of Vaud.—The Canton of Vaud, in south-west Switzerland, between lakes Geneva and Neuchatel, although one of the least mountainous cantons, has fully developed hydro-electric power, the sources of power being in the Joux and Rhone valleys. The power plant in the Rhone valley (Bois Noir) belongs to the municipality of Lausanne; its present capacity of 20,000 volts will soon be increased to 50,000. Owing to scarcity of materials the price of power has risen 25 to 50 per cent. during the war; meters determine amount of current used, and three different prices are charged according to the times of day. Government-controlled electric power has greatly aided small industries.—(*U.S. Com. Rep., July* 18, 1918.)

"Peat Wool," a New Scandinavian Substitute Fibre.—A factory is now being equipped at Hadenge in Jönköping Len for spinning peat fibre or "Fiberuld." The fibre will be further dealt with in a factory at Gothenburg.

Peat wool can be made into matting, carpet stuffs. etc., and with 10 per cent. of animal hair can be used for felt soles in footwear. With 30 to 40 per cent. of wool a product is obtained hardly distinguishable from wool-cloth. Fibre-wool thread is about 1½ times stronger than wool thread; it can therefore be used for binder twine. Fibre-wool costs 2·4*d*. per pound; and the cost of equal weights of a mixture of 1 part of wool to 2 of fibre-wool and of pure wool is as 8·8 to 24.

The process has been patented in Sweden, has been bought by a Danish syndicate, and is likely to be worked also in Denmark.—(*U.S. Com. Rep., July* 13, 1918.)

Chemical Industries in Sweden.—According to information supplied by H.M. Minister at Stockholm, the factory erected at Varberg to exploit seaweed (this J., 1918, 279 R) is about to start operating, with a German engineer as technical manager. A similar factory is to be established shortly in Skane.

A company has been founded at Stockholm to manufacture and sell motors and automobiles run on sulphite spirit. The minimum capital is to be 1,000,000 kronor. The proposed Government monopoly of the wholesale trade in technical spirit has aroused opposition in industrial circles.

Twenty Swedish industrial associations have formed an Export Industries Central Council, among the most important members of which are the Swedish Chemical Industries Office, and the Associations connected with the cellulose, wood pulp and timber industries. The Swedish Government is instituting an investigation of peat textiles. (*Bd. of Trade J., Sept.* 5, 1918.)

New Copper Deposit in Sweden.—According to the *Nya Daglight Allehanda* a deposit of copper (oxide) ore, containing 90 per cent. copper and some gold, has been discovered near Amot in Varmland.—(*Z. angew. Chem., July* 23, 1918.)

The Position of the Technically Trained in Germany.—The Engineers and Architects Society of Saxony has addressed to the Saxon Government and to all the important public bodies a memorandum on the subject of furthering public recognition of the work of technical men, and of the needed improvement in their general social position. Scientifically trained technical men must no longer take a second place to the lawyers; they must be officially represented on all State and local administrative bodies where use is made of their services; and the direction of technical undertakings must be given to technical men.—(*Z. angew. Chem., July* 19, 1918.)

Kapok Fibre in the U.S.A.—As a result of a questionnaire, the Bureau of Census has collected data concerning the stocks, uses, etc., of kapok in the United States. On May 1, 1918, 10,133,499 lb. was owned by manufacturers and dealers, of which 2,845,017 lb. was in hand, and 3,773,000 lb. still abroad, principally in Java, the remainder being in transit. The consumption in 1917 was 8,472,830 lb., or 45·7 per cent. more than in 1916. The estimated consumption for 1918 shows a further increase of 34·5 per cent. Of the 1917 consumption, about 58 per cent. was used for making mattresses, 21 per cent. for pillows, cushions and pads, and 2·8 per cent. for life preservers. The industry is centred chiefly in New Jersey, Massachusetts, Illinois, Ohio and California (in the order named), these States owning 94·4 per cent. of the entire stocks.—(*Bd. of Trade J., Sept.* 19, 1918.)

Briquetting in the U.S.A.—The annual output of fuel briquettes in the United States has increased from 66,524 tons in 1907 to 406,856 tons in 1917, when it was the greatest recorded. The increase over the production in 1916 was 38 per cent. in quantity and 55 per cent. in value. The number of plants in operation last year was two less than in 1916. Of the 13 plants in operation last year, 4 used anthracite as a raw material, 1 Arkansas semi-anthracite, 2 a mixture of anthracite and bituminous slack, 2 bituminous slack and sub-bituminous coal, 1 semi-bituminous coal, 1 lignite, and 2 oil-gas residue. At 2 plants coal-tar pitch was used as a binder; at 1, mixed coal-tar pitch and asphaltic pitch; at 5, asphaltic pitch; at 1, a patent binder; and at 4, no binder whatever.—(*U.S. Geol. Surv., May*, 1918.)

Sulphur, Pyrites and Sulphuric Acid in the U.S.A. in 1917.—Of the eight mines which were producing sulphur in 1917 two, one in Louisiana and the other in Texas, produced over 99 per cent. of the total quantity. The production in 1917 was 59 per cent. greater than in 1916, in which year the output was several hundred per cent. greater than in 1913. The imports of sulphur (chiefly from Japan) dropped to below 1000 tons and the exports rose to 152,833 tons, or 20 per cent. more than the figure for 1916, which was itself 70 per cent. more than in 1913. In the two chief deposits referred to, the sulphur occurs associated with limestone, and is mined by the Frasch process. A bore hole is put down, and superheated water forced down under pressure. This melts the sulphur, which collects at the bottom of the well, and is then raised to the surface by compressed air and allowed to solidify in large ponds. It is afterwards blasted and broken up for transport. Some of the wells are stated to have yielded over 100,000 tons of sulphur, and very considerable stocks are held at the surface. The chief uses of sulphur, other than for the manufacture of sulphuric acid, are for the production of sulphite pulp, and in agriculture for spraying, dipping, and as a fertiliser, its direct use for this purpose being said to show considerable promise. The average price for imported sulphur was $21·85 (89*s*. 6*d*.) per ton, and for exported sulphur $22·93 (93*s*. 11*d*.) per ton.

The production of pyrites in 1917 was 462,662 tons, an increase of about 39,000 tons over 1916, and the consumption of domestic and imported pyrites was 1,430,000 tons, about 240,000 tons less than in 1916. This decrease was due to the large falling-off in imports owing to the war. Pyrites is found in four main areas in the U.S.A.: the Appalachian Mountain Range, the interior States, the Rocky Mountain States, and the Pacific Coast

Range, but as over three-fourths of the pyrites is consumed in the district east of the Mississippi the production in the Western areas is hindered by the high cost of transport. The average value of pyrites reported by the producers was \$5·38 (23*s.* 8½*d.*) per ton.

The production of sulphuric acid in 1917 was twice that of 1913, and is stated to be well over 7,000,000 tons. Although there was some increase in the production of weaker acid in 1917, it was not nearly so great as the increase in acids of higher strength than 66° Beaume (168° Tw.). Owing to the decrease in imported pyrites there was at one time a danger of a shortage in production, but this has been avoided by changing over pyrites plant to the use of sulphur. This substitution of sulphur for pyrites is not likely to be continued after the war, as the sulphur is too valuable a material for the production of low grade acid. Very little extension in the use of pyrrotite ores has taken place, but it is considered that if ground finely and mixed with some crude sulphur this material will produce a gas suitable for many of the existing acid plants. Prices rose gradually in the early part of 1917 but fell off again towards the end of the year, and notwithstanding high prices and a ready market several plants were not working full time. Both on this account and because several new plants either have been or are being erected by the Government or private firms, there does not seem to be any fear of a shortage of acid in the near future. The raw materials used for sulphuric acid manufactured in 1917 were as follows:—Sulphur 483,827 tons, pyrites 1,257,138 tons, gold and silver bearing pyrites and galena 17,380 tons, copper bearing sulphides 856,033 tons, and zinc bearing sulphides 736,911 tons. The exports and imports of sulphuric acid were comparatively insignificant, the former amounting to about 31,000 tons and the latter to about 4000 tons.—(*U.S. Geol. Surv., July*, 1918.)

New Iron and Steel Works in Japan.—The British Consul at Shimonoseki reports that along a narrow strip of land between railway and sea in northern Kyushu a number of new iron and steel works are in course of erection, and existing works are in many cases making considerable extensions. The Nippon Ironworks, Ltd., is considering a large increase in its capital, which now stands at £300,000. The erection of a 50-ton blast furnace is proceeding, together with smelting furnace, coke ovens, and coal-washing plant. It was expected to commence pig-iron production in August, 1918. Following this it is proposed to instal a 120-ton unit, and then to undertake the manufacture of steel rails. The company will own and work collieries and iron mines, and finance other undertakings of like nature.

The Nippon Pig Iron Co. (capital £150,000) is a subsidiary of the Tokio Wire Rope Co. Three blast furnaces and a 20-ton smelting furnace are being erected. Manufacture of pig iron began in May. The greater part of the output will go to the parent company. The Tokio Steel Works at Kokura has been in operation for some time, and is now erecting a wire rope plant. The present steel output is 3500 tons per month, of which the wire rope works will take 2500. A 25 per cent. increase in capital is contemplated. The Oriental Steel Works, Ltd., will, when the present programme is completed, be one of the principal steelworks in Japan. A 150-ton smelting plant is expected to be working by January 1919, and shortly after a 250-ton furnace is due to be completed. Supplies of Chinese ore will begin to arrive from September.

The expert adviser to the Nippon Iron Works is of the opinion that, as a consequence of all these plants being erected within a narrow area, there will be keen competition, ending sooner or later in a crisis. Either the smaller firms will be extinguished by the stronger, or a great steel combine will be formed with the Imperial Steel Works as a focus.—(*Bd. of Trade J., Sept.* 5, 1918.)

GOVERNMENT ORDERS AND NOTICES.

THE GAS COKE PRICES ORDER, 1918.

1. This Order, which came into force on October 7, applies to all sales of gas coke or breeze in the United Kingdom for such purposes as the Household Coal Distribution Order, 1917, or the Household Fuel and Lighting Order, 1918, do not apply to.

2. The Order fixes the maximum price of ordinary large gas coke delivered to a consumer by road vehicle in any district at the second highest price fixed under the Household Fuel and Lighting Order, 1918, for sales of coal in that district, and the maximum price of unscreened breeze delivered to a consumer by road vehicle at 40 per cent. of the above price.

3. The maximum prices for ordinary large gas coke and for unscreened breeze delivered to the consumer in railway wagon, barge, or cargo are fixed at 12*s.* per ton less than the corresponding prices in 2 above for the Metropolitan fuel area; and in the case of deliveries in the rest of Great Britain at such an amount less than the corresponding prices in 2 above as has been fixed by the Local Fuel and Lighting Committee for the district in respect of loading, cartage, and delivery of coke, or, where no amount has been fixed, at 10*s.* per ton less.

4. Certain additional charges may be made, but any such charge must be shown on the invoice.

5. The price to a wholesale merchant shall be 1*s.* 3*d.* per ton less than the price to a consumer.

6. On contracts for not less than 50 tons per month over a period of not less than twelve months, the maximum prices prescribed by 2, 3, and 5 above shall be reduced by 10 per cent.

7 and 8. The Controller of Coal Mines may, by notice, suspend the operation of the Order or of any of its provisions, and may increase or reduce the maximum prices either generally or as regards any particular class or case.

9. The prices payable under existing contracts must be modified so as to conform with the prices fixed in the Order.

[For full text see *London Gazette*, October 4.]

OTHER ORDERS.

The Explosives in Coal Mines Order, 1918. Home Office, Sept. 18.

The Sale of Flax Seed (Ireland) Order, 1918. Ministry of Munitions, Sept. 20.

The Flax Seed (Shipment from Ireland) Order, 1918. Ministry of Munitions, Sept. 20.

Disposal and Control of Waste. Defence of the Realm Regulation, 2EE. Army Council, Sept. 27.

The Imported Flax (Dealings) Order, 1918. Army Council, Sept. 27.

The Fuel Wood Order, 1918. Board of Trade, Oct. 1.

DEALINGS IN DETONATORS.

The Army Council gave notice on October 1 that all persons are permitted to buy, sell, or deal in detonators within Great Britain, and that applications for a permit to deal in detonators involving communication outside Great Britain should be addressed to the Secretary, M.I.6D., War Office, S.W. 1.

IMPORTS AND EXPORTS.

By Prohibition of Import (No. 27) Proclamation, 1918, the importation into the U.K. of *cassia lignea* has been prohibited, except under licence.

The Director of the War Trade Department has intimated that he is now prepared to consider applications for the export of goods to Denmark. Guarantees from the Danish Merchants' Guild or Chamber of Manufacturers should be sent with applications.

Price of Aluminium.—The Minister of Munitions has announced that from January 1, 1919, the control price of aluminium ingots (98—99%) will be reduced from £225 to £200 per ton, carriage paid to consumers' works. There will be no change in the price of remelted scrap and swarf ingots.

COMPANY NEWS.

CALICO PRINTERS' ASSOCIATION, LTD.

The annual meeting was held on September 18, in Manchester. The chairman, Mr. Lennox B. Lee, after reviewing the balance sheet, said although the directors had received a provisional assessment from the revenue authorities in regard to excess profits duty, they were still negotiating on several important points. The Association had a low basis for computing that duty, and the concessions regarding stock valuation announced by the Government did not appear likely to be of any use in meeting the probable ultimate loss when high-priced stocks were realised. Trade had gradually declined during the past year, and owing to high costs of production they could not now offer their goods at prices which would tempt customers. In India the falling-off had been most marked. The immediate future was likely to be one of some anxiety. Discussing the subject of dyes, Mr. Lee said the Association was the largest consumer of colours in the country. Before the war over 70 per cent. of the 2000 dyes they then used were made in Germany only, and less than 7 per cent. were British. Of about 230 essential base colours, only 25 per cent. were now being produced by British makers, and about one-third of these were used because no better could be obtained, while the cost was 200—1000 per cent. above pre-war figures. Of the 230 colours, the commoner sorts were obtained from British makers, the finer kinds have still to be brought from Switzerland, and fully half of the number was unprocurable. The proposed remedy of extending Government control to two large dye-making organisations was unlikely to be more successful than when that control was confined to one. Restriction on colour imports, which was a natural corollary to the scheme, involved a principle which would affect prejudicially the textile trade of the country. Cotton exports in 1913 were valued at over £127,000,000, of which £56,000,000 worth was exported in the coloured state. If the industries which produced this sum were in the future unable to get their colouring matters under equally favourable conditions compared with other countries, they would quickly lose their reputation and trade, and the uncoloured trade would probably follow. How far would the proposed policy of restricting dye imports for ten years or more avoid this danger? New business depended largely upon the production of novelties, and foreign dye-makers would not send their new colours to this country if the importation of the bulk of their production was prohibited. No one wished to buy from Germany, but if this country was to become independent the Government must institute a scheme of co-ordination which would include those trades which have relevance to colour manufacture; and financial aid should not be given in the form of loans but as definite grants. Had this been done in 1914 and the Swiss dye experts been called in, he believed that by this time the majority of colours would have been made successfully in this country.

THE MOND NICKEL CO., LTD.

Speaking at the fourth ordinary general meeting held in London in July last, Mr. Robert Mond, chairman, said that progress in the extension of plant had been less rapid than was expected. In Canada the management had also suffered from scarcity of labour and of essential supplies, but to a lesser extent. The output of Bessemer matte had been substantially increased and a policy of vigorous exploration had been pursued. Additional quantities of high grade ore had been added to the reserves so that the future was secured for very many years to come. Owing to the sustained output and to the slightly increased price of copper sulphate, the result of the year's trading had been satisfactory, notwithstanding the great increase in the cost of manufacture.

At the adjourned meeting held on September 26, Mr. Mond dealt with the accounts of the year ended April 30 last. The balance at credit of profit and loss was £531,845, an increase of about £196,000 over the previous year. The available balance was £616,851, as against £410,198. The ordinary shares received an interim dividend of 5 per cent., less tax, and a further 15 per cent., tax free, in July. £250,000 was to be placed to reserve, leaving £118,251 to be carried forward.

ASSOCIATED PORTLAND CEMENT MANUFACTURERS (1900), LTD.

The report for the year ended June 30 shows that profits were considerably better than in the previous period. The gross profit was £555,935, compared with £372,186, and the net profit £415,887, as against £253,287. It has been decided to pay one year's dividend on the preference shares, which will clear the arrears up to June 30, 1916, and to place £100,000 to reserve and depreciation account. The issued capital stands at £4,207,040, debentures, mortgages, etc., at £4,545,600, £104,000 having been redeemed out of revenue during the year.

At the annual meeting held in London on September 30, Mr. F. A. White, chairman, said that the enterprise in British Columbia had continued to suffer owing to the war, as all general constructional work was there at a standstill. The conditions in Mexico had improved and were distinctly hopeful; and in South Africa good results had been obtained. In this country there is now a greater demand for cement—chiefly for Government requirements—than at any time during the war, but general business has of late been starved and exports have ceased. The action of the Government in depleting the company of much of its skilled and semi-skilled labour at a time when cement was in urgent demand for military purposes was surprising.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—This company has just issued a further 500,000 ordinary shares of £1 each at 20*s*. 6*d*. per share, bringing the total issued capital up to £2,584,189. The company, with its associated companies, supplies energy throughout an area of 1400 sq. miles, and claims to be the largest producer of electrical energy in the United Kingdom. At the end of 1917, 374,856 h.p. was connected to the company's system and 20,007 h.p. has been added since. The net profits have risen steadily from £85,910 in 1912 to £221,308 in 1917, and the ordinary dividend from 5 to 8 per cent. in the same period. (See this J., 1918, 40 R.)

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, September 26 and October 3.)

OPENINGS FOR BRITISH TRADE.

Firms at Calcutta desire agencies for U.K. manufacturers of hardware, etc. [Ref. Nos. 291, 294.]

A firm at Wellington, New Zealand, desires agencies for U.K. manufacturers of hardware, etc. [Ref. No. 293.]

Agents at Lyons and Grenoble wish to represent U.K. manufacturers of preserved foods, chemicals, and pharmaceutical products. [Ref. Nos. 300, 301.]

Firms at Toronto and at Montreal desire agencies for U.K. manufacturers of druggists' sundries, dyes, heavy and pharmaceutical chemicals, oils, paints, etc., etc. [Ref. Nos. 296, 297, 298.]

A Canadian firm able to export sheep dips, disinfectants, medicines, etc., wishes to get into touch with importers in the U.K. [Inquiries to the Canadian Government Trade Commissioner, 73, Basinghall Street, E.C. 2.]

TARIFF. CUSTOMS. EXCISE.

Australia.—The importation of foodstuffs in any package which shall have in contact with the food or liquid a surface composed of lead or zinc is prohibited as from May 16.

Canada.—The *Board of Trade Journal* for September 26 gives further lists of articles the importation of which is prohibited except under licence. The lists include metals their ores and derivatives, acids, oils, paints and varnishes, sulphur oil and grease, all coal-tar distillates, candlepitch, vegetable stearin, explosives, matches, perfumery, soaps, wood tar, artificial silk, hoofs, horns and bones, cork, starch, gelatin, glue, size, tanning materials, many drugs, sugar, rubber, glassware, paper, etc.

East Africa Protectorate.—The importation of sisal hemp, sisal waste, and tow is prohibited except under licence as from June 30.

France.—Pharmaceutical preparations containing quinine salts as a base may be exported only under special sanction in each case as from September 8.

The *Board of Trade Journal* for October 3 gives a list of increased import duties on certain articles. The list includes beer, wines, vinegar and acetic acid, sugar, condensed and dried milks, etc.

Mexico.—The import duty on tinplate, certain chemicals, artificial silk, etc., has been increased as from August 19. A translation of the Presidential Decree may be seen at the Board of Trade.

Switzerland.—The exportation of all goods is prohibited except under licence as from Sept. 5.

United States of America.—The *Board of Trade Journal* for October 3 gives further recent rulings of the War Trade Board respecting the regulation of imports and exports.

The American Consuls in the U.K. will as from October 1 certify no invoices for ocean shipment of goods, except on receipt of an import licence number.

CHANGES IN THE AUSTRALIAN CUSTOMS AND EXCISE TARIFFS.—The following changes became operative on September 26 last:—*Customs Tariff (U.K. and General)*—per gallon: Collodion, 5*s.*; methyl alcohol, 2*s.*; spirits denatured, 3*s.*; perfumed spirits, 30*s.*; spirituous preparations, essences, etc., 6*s.* 3*d.* to 25*s.*, according to strength. *Excise Tariff*—rate of duty, per gallon: Industrial spirit, 24*s.*; methylated spirits, 1*s.*; fortifying spirit, 6*s.*; vinegar spirit, 2*s.*; spirit for toilet preparations, 20*s.*; amyl alcohol, 25*s.* Potable alcoholic liquors are also affected.

TRADE NOTES.

BRITISH.

COMMERCE AND INDUSTRY AFTER THE WAR.—This was the subject of a lecture delivered by Sir Albert Stanley, President of the Board of Trade, in London on October 2, under the auspices of the Industrial Reconstruction Council. Mr. G. Barnes, who presided, said that the Government would be unable to restore trade union conditions in their entirety, and, therefore, as compensation there should be a shorter working day, a standard rate of wages, and more security against unemployment.

Sir A. Stanley said that it was necessary to organise in such a way as to make possible the complete overhauling of our industrial equipment and the establishment of large-scale production; and more systematic efforts must be made towards the provision of increased supplies of raw materials. In some cases, as for example, flax cultivation and mining, Government co-operation and assistance would be needed, but whatever means were taken to rehabilitate and strengthen our industries, nought would avail unless workers were raised to the highest level of efficiency, and unless there was complete co-operation between employers and employed. Without interfering with the conduct of business, the Government would have to exert its influence in certain directions: it must provide trades with the fullest possible information as to foreign markets, protect British enterprises abroad more actively, and foster "key" industries. State assistance, however, implied State supervision. The Government might also lead in regard to transport. The railways must be worked in such a way as to secure the advantage of standardisation and avoid overlapping and waste, and the canal system should be developed. At the present time the questions of coal conservation, the provision of large electrical generating stations, and the utilisation of water power were being considered by the Government. State control of industry should be confined to the transition period between war and peace, and should be limited to definite purposes, such as the securing of food and material supplies, and the equitable allocation of materials and plant among competing industries.

THE GROUNDNUT INDUSTRY OF BRITISH INDIA.—In a press note issued by the Bombay Government the estimated yield for 1916-17 of groundnuts in shells for the whole of the Bombay Presidency is given as 208,000 tons from 226,000 acres. The following figures show the exports from British India of groundnuts from all sources during recent years:—

	Year	Export	Value
		cwts.	£
Groundnuts	1912–13	4,867,011	2,694,520
	1913–14	5,558,140	3,254,246
	1914–15	2,766,448	1,515,608
		gallons	
Oil	1912–13	227,053	23,137
	1913–14	228,190	30,013
	1914–15	223,363	22,967
		cwts.	
Groundnut oil cake	1912–13	1,247,925	265,385
	1913–14	1,240,533	261,971
	1914–15	1,287,491	261,475

The groundnut cake was sold in England before the war at £6—£7 and at about 30 dollars per ton in America, where it was used as cattle food. The necessity of avoiding waste is emphasised: the paper-like husks containing the seeds may be used for stuffing mattresses and cushions, and possibly also as a source of cellulose (55 per cent.) for paper making. The ash from the cake is rich in phosphates and makes a good fertiliser, as does also the thin red coating of the kernels. Now that German East Africa has been acquired, British India and

the United States together control the greater part of the world's output of groundnuts.—(*Bd. of Trade J., Sept.* 12, 1918.)

Export of Coromandel Groundnuts to the U.S.A. —The first large direct shipment of shelled groundnuts from Madras to the United States was made in April last. It consisted of 2424 tons (30,850 bags of 176 lb.), valued at £95,000.—(*U.S. Com. Rep., July* 29, 1918.)

New Chemical Works in Ontario.—A new company is to be formed to manufacture dyes, with works, estimated to cost one million dollars, on the river front at Sandwich, Ontario. H.M. Trade Commissioner is informed that the company will also build a factory at Walkerville, Ontario, for the production of toluol.—(*Bd. of Trade J., Sept.* 5, 1918.)

FOREIGN.

The 1918 Sample Fair at Lyons.—The following statistics refer to the 1918 and two previous fairs:

Year	Participants			Business done	Stands occupied
	France and Colonies	Allies and Neutrals	Total		
1916 ...	1,200	142	1,342	£3,797,010	760
1917 ...	2,073	541	2,614	£16,300,780	2,256
1918 ...	2,346	836	3,182	£29,818,500	2,332

The 1918 participants were: France 2136, French Colonies 210, United States 527 (482 firms, however, sent catalogues only), Great Britain 113, Italy 40, Russia 4, Canada 2, Portugal 2, Belgium 1, Switzerland 102, Spain 21, Sweden 21, Netherlands 3. It is believed that the Lyons Fair will be a permanent organisation of international importance. Preparations are in hand for the 1919 fair.—(*U.S. Com. Rep., July* 18, 1918.)

Canton of Vaud Sample Fair.—This fair is organised by the Chamber of Commerce of the Canton and the Industrial and Commercial Society of Lausanne. Only Swiss industries and artisans established in the Canton are allowed to exhibit, merchants and traders being barred. The number of exhibits was 120 in 1916, 287 in 1917, and 303 this year. The chemical products exhibited included drugs, varnish, agricultural products, and glass ware.—(*U.S. Com. Rep., July* 26, 1918.)

Projected Combine of Swiss Dye Manufacturers. —The three chief Swiss colour-making firms—the Society for Chemical Industry, the Geigy Company, and the Sandoz Chemical Works—have called meetings of shareholders to consider proposals for a close working agreement among the three concerns. It is understood that the arrangement will follow closely that of the German colour-makers—that is to say, there will be a long-term agreement, under which profits, processes, and patents will be pooled, but each firm will retain its individuality so far as management is concerned.—(*Manch. Guard., Sept.* 18, 1918.)

Italian Chemical Trade Notes.—The iron and steel company Alti Forni ed Accia-ferie d' Italia announces a general meeting to deal with the question of absorbing the Ilva, Ferriere Italiana, Siderurgica di Savona and Ligure Metallurgica companies, and of raising its capital from 52,000,000 to 300,000,000 lire.

Dyes.—At the end of 1916 the Industrie Nazionale Colori di Anilana was established in Milan with a capital of 6,000,000 lire. According to the prospectus, this company was to be in a position to replace German aniline products with goods of Italian manufacture. The report for the year 1917 reveals the fact that in spite of the assistance of British experts the company has not been able to start manufacture. The machinery required was to have been delivered about June, 1917, but towards the end only part of it had arrived.

The Fabriche Italiane Materie Coloranti Bonelli of Milan has increased its capital from 8,000,000 to 14,000,000 lire so as to be in a position to deal with the large demand of the textile industry for dyes after the war.

Oils and Fats.—The Italian authorities report that the production of oil is about that of an average year. The decline in imports to the extent of several hundred thousand double-cwts., and the increased demand in consequence of a scarcity of other fats, have resulted in an appreciable shortage of oil in the northern provinces. Only five provinces this year were able to export oil. Owing to transport difficulties an equal distribution between the different provinces was impossible.

Petroleum.—The report of the Società Petrolifera Italiana states that, preliminary operations and arrangements having been completed, boring and production will soon follow. The machinery, cables, tools, etc., required for the preliminary operations are said to have been supplied by England and America. Eighteen borings are in operation, including the wells previously working. Borings are also being investigated at Miano, and new springs are being planned near Valozza Neviano.

Sulphur.—At the end of 1915 the market was unfavourably affected by large accumulated stocks of sulphur ore, but in 1916 the stocks in Sicily were reduced in consequence of increased exports and a decrease in the production from 323,000 to 155,000 tons. The average price in 1916 was 159·90 lire (the export price is now 425 lire in gold). The Mologna district was the only one which did not experience a decline, the number of works in operation being eight. An experimental plant was erected in this district for the purpose of utilising sulphur vapours in the manufacture of sulphuric acid. Exports of Sicilian sulphur were 143,002 tons for the first ten months of 1917. Italy exported 373,000 tons in 1915 and 407,000 tons in 1916.

The annual report of the Montecatini company for 1917 deals with the increase of its share capital and the amalgamation with the Trezza Albani Sulphur Mines in Romagna. The increased production of pyrites has enabled the company not only to supply the requirements for war and agricultural purposes but also to export some to France. Out of a total Italian production of 500,000 tons of sulphur in 1917, Montecatini was responsible for 388,069 tons, or 80 per cent. more than in 1916. The Agoria mines (Cordevole) had to be closed down at the end of October for military reasons, but all measures were taken to prevent the enemy from working them. The net profit of the company amounted to 6,091,723 lire. The Italian sulphur industry has to compete with that of the U.S., which in 1917 produced over 1,000,000 tons.

A company has been formed in Milan under the title of the Sindacato delle miniere Sulfuree di Romagna Montèvecchio e Boratella III, with a capital of 450,000 lire, for the purpose of exploiting the old sulphur mines at Montevecchio and Boratella III. Both mines were formerly renowned for their good yields, and were only partially exhausted, several hundred hectares remaining unworked. The mines were closed down during the 1901 crisis owing to financial difficulties.

The management of the Consorzio Solfifero is said to have submitted proposals regarding a settlement of the present crisis and for the furtherance of the sulphur industry in general. It is proposed that the Consorzio Solfifero should no longer be

merely a sales syndicate as hitherto, but should act as an official intermediary between the Government and the producers. The grants which have hitherto been made to the Consorzio by the Government—and indirectly to the sulphur industry—are to be retained, but it is proposed to increase the duty by 1 lira per ton. It is also proposed that the land laws of Sicily should be revised so that the owner of land should also have a right to its mineral wealth; and that commissioners should be appointed to adjudicate on questions relating to concessions, etc.—(*Z. angew. Chem., July* 16, 23, 1917.)

TAIWAN (FORMOSA) IN 1917.—The external trade of Formosa is mainly with Japan, more than 72% of its export trade and almost 72% of its import trade being with that country. The following list shows the principal imports of chemical interest, together with the countries of origin :—

Beer, bottled, 235,567 dozen (all from Japan); oilcakes, 139,000 tons (China 39%, Japan 9%, Kwantung 9%); artificial manure, 59,000 tons (all from Japan); opium, 105 tons (British India 60%, Persia 40%); paraffin wax, 141 tons (British India 24%); petroleum, 4,903,536 gallons; soya, 558,932 gallons (all from Japan); sugar, 780 tons (all from Japan).

Sugar continued to be the principal item of export in 1917, 410,000 tons being exported, an increase of 12% over 1916. Of this, 80% went to Japan, 7% to Canada, about 1·2% to Australia, and 0·6% to British India. Camphor exports have already been described (this J., 1918, 247 R). Of alcohol, 16,239,205 litres was exported, or 25% more than in 1916; 65% of the total went to Japan. Other exports included 104 tons of copper, containing gold and silver, which also went to Japan.—(*U.S. Com. Rep. Supp., June* 4, 1918.)

HONGKONG IN 1917.—The trade of Hongkong in 1917 (see this J., 1918, 255 R) has been greatly affected by the European War and by the state of unrest in China. The high prices of many commodities in Europe and America stimulated the domestic manufacture of many materials which had previously been imported. During the year a modern tannery has been erected with Chinese capital, using American machinery and methods. A soap factory, erected by German interests before the war, has been renovated and is beginning to manufacture on a considerable scale. Several cement factories, owned by a Hongkong company, are also in operation. Chinese industries, including the ginger and canning factories, small foundries, glass works and distilleries have done well. As a result of the strong demand for the metal in Europe and the U.S.A., there was a boom in tin smelting and refining. The scarcity of coal in Japan, North China and Indo-China, which at times approached the famine stage, greatly interfered with Hongkong industries.

The limited imports of paint came chiefly from the U.S.A., the market living largely on local manufactures and stocks of British and other paints. Prices were too high to admit of an active market, although the demand for low-priced decorative and house paints was great.

The sugar trade of Hongkong in 1917 has already been described (this J., 1918, 248 R).

The import trade in chemicals was largely measured by what the U.S.A. could supply. The year opened with large imports of heavy chemicals and standard drugs from America, but export restrictions materially affected the trade in the closing months of the year, particularly in caustic soda, soda ash, glycerin, ammonia, etc. There was a steadily increasing trade with the U.S.A. in all standard drug products such as quinine, castor oil, iodoform, ipecacuanha, sugar of milk, cyanide of potassium and various acids. Circumstances have, however, forced up the prices to such a point as to affect the demand. The trade in heavy chemicals will probably revert to Great Britain after the war, but the introduction of standard drugs at prices comparing favourably with those of European articles promises to secure a permanent improvement in this branch of American trade.

The trade in essential oils was comparatively satisfactory. The total exports of all essential oils from the port amounted to 13,158 cases, of which 5822 cases were for the U.S.A. and Canada, 5627 for Great Britain, and 1709 for Europe. The quantity of aniseed oil exported increased, although the value declined, the price dropping to one-half to one-third of the pre-war price. The export of tea oil, peppermint oil, and similar oils was far below normal, partly as a result of the difficulty of trading with India. There was a similar falling off in Chinese chemical, drug and medicinal products usually shipped to India in considerable volume, and the South China export of camphor has practically ceased. There have been increased shipments of hides to the U.S.A.

American trade in the Far East is undoubtedly in a far better position than it ever has been, not only in volume and profit, but in relation to the future.—(*U.S. Com. Rep., Supp., June* 8, 1918.)

REVIEWS.

THE PRACTICE OF PHARMACY. *By the late* PROF. JOSEPH P. REMINGTON, *assisted by* DR. E. FULLERTON COOK. *Sixth edition. Pp.* xxviii + 1987. *(Philadelphia and London: J. B. Lippincott Co., 1917.) Price* 35*s. net.*

THE DISPENSATORY OF THE UNITED STATES OF AMERICA. *By the late* PROF. JOSEPH P. REMINGTON, DR. H. C. WOOD *and* DR. S. P. SADTLER. *Twentieth edition. Pp.* cxxii + 2010. *(Philadelphia and London: J. B. Lippincott Co., 1918.) Price* 50*s. net.*

A melancholy interest attaches to the publication of the latest editions of these two monumental volumes owing to the death, on the first day of this year, of Prof. J. P. Remington, whose master mind conceived and brought to its present perfection "The Practice of Pharmacy," the American handbook *par excellence* for pharmacists and physicians, and an invaluable text-book for students the world over. Prof. Remington was for many years chairman of the Committee of Revision of the United States Pharmacopœia and the best known pharmaceutical authority in the United States. The first edition of Remington's "Pharmacy" was published thirty-two years ago, and each successive volume has given evidence of the ceaseless vigilance of the author in keeping pace with the world's progress in pharmacy. The present edition is no exception. It is not only a treatise on pharmacy but it embraces all the chemistry and materia medica of the National Formulary (now recognised as one of the Standards under the National Food and Drugs Act) and of the United States Pharmacopœia. As indicative of the wide field covered it may be mentioned that the book consists of an Introduction dealing with theoretical and practical pharmacy, and with Pharmacopœias and Dispensatories, followed by six Parts. Each Part is devoted to careful treatment of specific subjects such as metrology (20 chapters), official pharmacy (11 chapters), inorganic substances (17 chapters), organic substances (14 chapters), magistral pharmacy (7 chapters) and a section dealing with formulas for unofficial preparations, a "Glossary of Uncommon Names, Terms or Substances," and

a comprehensive index. Naturally, in such a book, the most extensive enlargement is in the realm of magistral, or extemporaneous, pharmacy, and to that section many new articles have been added. These treat mainly of the latest methods and processes in sterilisation, the filling of ampoules, the making of compressed tablets and other advances in latter-day pharmaceutics. A thorough revision has been made of the condensed charts of inorganic chemical substances, vegetable official drugs and animal substances. These will be found extremely useful to students preparing for examination, and in this connexion a feature (characteristically American) is the "Quiz" column, appended to each chapter, which is designed to test the progress of the student. The volume is illustrated throughout with over eight hundred drawings and photographic reproductions of apparatus used in chemical and pharmaceutical processes and of facsimile prescriptions. The illustrations have been revised by Dr. J. Percy Remington (a son of the author), who made most of the outline drawings reproduced in the illustrations. Acknowledgments for assistance rendered are also made to Dr. A. H. Fitz-Kee and to Dr. A. P. Hitchens.

From 1883 (when the fifteenth edition was published) until his death Professor Remington was associated with successive productions of the "United States Dispensatory." In the Preface to the latest edition it is stated that Prof. Remington, feeling strongly the need of pharmacists for the "Dispensatory," forced himself, regardless of failing health, to hasten the work of revision. He finished the manuscript, but died while the work was in the press. The "Dispensatory" is an elaborate commentary on the United States and British Pharmacopœias, while those preparations of the German Pharmacopœia and French Codex that are generally used in the United States are likewise commented upon. The three main points constituting the book contain (1) a discussion of all the remedies recognised by either of the two Pharmacopœias used by English-speaking people; (2) the National Formulary and non-official drugs; and (3) the tests and test solutions of the two Pharmacopœias, weights and measures, the art of prescribing medicines and cognate matters. The great advances in pharmacy and medicine since the last edition was published have necessitated so extensive a revision that the subject matter has been almost entirely re-written. The new features include the introduction of the new standards of the latest issues of the U.S.P. and B.P. and the N.F. The change in the character of the last-named from a collection of recipes to a legal authority for purity has led to a consideration of all the crude drugs standardised by that work. In view of the increasing demands for scientific accuracy in pharmacy and medicine, greater prominence is given to the subject of chemical incompatibilities. During recent years organotherapeutic remedies have been coming more and more into favour among medical men, and this has meant increased attention to the subject of the so-called vaccines and the various serums. Technical and analytical chemists will be particularly interested in the fact that the provisions of the American Food and Drugs Act of 1906 are printed in full, together with a summary of the food inspection decisions up to date. Details of the Harrison Narcotic Act of 1914 (revised up to 1917) are also included and these must prove of immense convenience for reference purposes to chemists, pharmacists and medical men. In a work of so encyclopædic a character the index is extremely important, and this, as usual, is excellent. It takes up 186 pages alone, and the authors accord special recognition in this connexion to Dr. E. F. Cook. W. Chalmers.

American Lubricants. *By* L. B. Lockhart. Pp. 236. (*Easton, Pa.: The Chemical Publishing Co. London: Williams and Norgate.* 1918.) *Price* 10*s. net.*

The author tells us in the preface that this book has been written to aid the user and the buyer of lubricants in a more intelligent selection of oils and greases. It opens with a brief account of the sources and characteristics of American crude petroleums, the methods by which they are split up into the various commercial products and the chief characters of these products. The term "blended oils" is applied to lubricating oils made by mixing mineral oils of different viscosities, and the term "compounded oils" to those made by mixing mineral oils with fatty oils.

The function of a liquid lubricant in preventing solid friction, wear and tear and high power losses, and in substituting for these fluid friction and much lower power losses is clearly explained in the light of modern science. The author adopts the theory that under definite conditions of speed and pressure the coefficient of friction is solely dependent upon the viscosity of the oil. That the property of "oiliness" has any important influence in helping to form and maintain the lubricating film he considers not disproved, but unsupported by any evidence, and he holds that viscosity, adhesion and capillarity are the sole characteristics of importance. Adhesion is always adequate, all oils cling to or "wet" all solids, no slip takes place between the lubricant and the metal surface and consequently the internal friction or viscosity of the oil need only be considered. Other tests are necessary in order to ascertain the source of an oil, its purity, safety, etc., but viscosity is the sole criterion of value so far as the reduction of friction is concerned, and all oils having the same viscosity have the same friction coefficient. As regards the existence of the property termed "oiliness," the author's sceptical views are not generally entertained by experts in this country, and it is hoped that further light will be thrown upon this question by researches which are projected under the auspices of the Department of Scientific and Industrial Research. The author regards the results obtained with oil-testing machines in practice as generally unsatisfactory, but he admits the usefulness of these machines in solving scientific problems.

Chapters follow dealing with the lubrication of internal-combustion engines, automobiles, electrical machinery, steam engines and cylinders, steam railways, textile machinery and miscellaneous plants and machines, in all of which much useful practical information and advice are given which appear to be based upon sound reasoning and wide experience. Physical and chemical methods of testing lubricants are very briefly described, the tests being generally those used by the American oil trade. Viscosities are expressed as times of efflux at 100° F. for ordinary oils, and at 210° F. for cylinder oils, from the Saybolt Universal Viscometer. A table for converting these figures to Engler numbers is given on page 218. The fact that these so-called "viscosities" are purely arbitrary numbers is made quite clear, and it is satisfactory to find that the author anticipates the adoption of units expressed in absolute measure as soon as the necessary figures for conversion are published by the U.S. Bureau of Standards. Pending the completion of this work, which depends upon the standardisation of the Saybolt viscometer, full references are given to the Bureau publications dealing with this aspect of the subject. Gravities are expressed throughout the book on the Baumé scale as sanctioned by the Bureau of Standards. One could criticise many of the test methods, but

as representing American practice they serve the purpose of the book in guiding the user in the choice of lubricants and in the meaning of the technical terms and figures he needs to understand. About 30 pages are devoted to lubricating greases and fixed oils, and 48 pages to American specifications for fatty oils, cylinder oils, engine, machinery and car oils, cutting oils, greases, burning oils and fuel oil. Then follow, curiously, chapters on gasoline and kerosene. The final chapter includes a number of conversion and other tables.

This is essentially a practical book, quite up-to-date and in accord with modern theory. It will prove of value to all users of lubricants who possess the necessary scientific and technical knowledge and also to those chemists who have to advise on these matters. It is, of course, as the title indicates, written purely from the point of view of American practice, but will be found none the less generally useful. The gallon used throughout the book is the American gallon of 8·328 lb.

The book is well printed, has a good index and very few typographical errors; one of these, on page 119, is important: the fraction on the third line should be $\frac{69}{13}$″. L. ARCHBUTT.

PUBLICATIONS RECEIVED.

THE APPLICATIONS OF ELECTROLYSIS IN CHEMICAL INDUSTRY. *By* A. J. HALE. *Pp.* 148. *(London: Longmans, Green and Co.,* 1918.) *Price* 7*s.* 6*d.*

ANNUAL CHEMICAL DIRECTORY OF THE UNITED STATES. *By* B. F. LOVELACE *and* C. C. THOMAS. *Second Edition,* 1918. *Pp.* 534. *(Baltimore, U.S.A.: Williams and Wilkins Company. London: Cambridge University Press, Fetter Lane, E.C.) Price* 5 *dollars, net and post free.*

PUBLICATIONS OF THE DEPARTMENT OF MINES, CANADA. *(Ottawa: Government Printing Bureau,* 1918.)

ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1916. *By* J. MACLEISH.

REPORT ON THE CLAY RESOURCES OF SOUTHERN SASKATCHEWAN. *By* N. B. DAVIS.

ANALYSES OF CANADIAN FUELS. *By* E. STANSFIELD *and* J. H. H. NICOLLS. PART I., THE MARITIME PROVINCES. PART II., QUEBEC AND ONTARIO. PART III., MANITOBA AND SASKATCHEWAN. PART IV., ALBERTA AND NORTH-WEST TERRITORIES. PART V., BRITISH COLUMBIA AND YUKON TERRITORY.

PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR. *(Washington: Government Printing Office,* 1918.)

MANGANESE AND MANGANIFEROUS ORES IN 1916. *By* D. F. HEWETT.

MAGNESITE IN 1917. *By* C. G. YALE *and* R. W. STONE.

ANTIMONY IN 1916. *By* E. S. BASTIN.

GRAPHITE IN 1917. *By* H. G. FERGUSON.

MICA IN 1917. *By* W. T. SCHALLER.

SLATE IN 1917. *By* G. F. LOUGHLIN.

GEMS AND PRECIOUS STONES IN 1917. *By* W. T. SCHALLER.

FELDSPAR IN 1917. *By* F. J. KATZ.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN THE EASTERN STATES IN 1917. MINES REPORT. *By* J. M. HILL.

PUBLICATIONS OF THE UNITED STATES BUREAU OF MINES, DEPARTMENT OF THE INTERIOR. *(Washington: Government Printing Office,* 1917.)

THE MINING INDUSTRY IN THE TERRITORY OF ALASKA DURING THE CALENDAR YEAR 1915. *By* S. S. SMITH. *Bulletin* 142. *Price* 10 *cents.*

CARBON MONOXIDE POISONING IN THE STEEL INDUSTRY. *By* J. A. WATKINS. *Technical Paper* 156. 5 *cents.*

PERMISSIBLE EXPLOSIVES TESTED PRIOR TO JANUARY 1, 1917. *By* S. P. HOWELL. *Technical Paper* 169. 5 *cents.*

ANSWERS TO QUESTIONS ON THE FLOTATION OF ORES. *By* O. C. RALSTON. *Technical Paper* 149. 5 *cents.*

ORGANISING AND CONDUCTING SAFETY WORKS IN MINES. *By* H. M. WILSON *and* J. R. FLEMING. *Technical Paper* 103. 20 *cents.*

THE DETERMINATION OF NITROGEN IN SUBSTANCES USED IN EXPLOSIVES. *By* W. C. COPE *and* G. B. TAYLOR. *Technical Paper* 160. 10 *cents.*

PREPARATION OF FERRO-URANIUM. *By* H. W. GILLETT *and* E. L. MACK. *Technical Paper* 177. 5 *cents.*

PERSONALIA.

Dr. D. Orme Masson, professor of chemistry at Melbourne University, has been given the Order of Commander of the British Empire (C.B.E.) for services on the Advisory Council of Science and Industry in connexion with the war.

Mr. Irvine Masson, son of Prof. D. Orme Masson, has been granted the degree of Doctor of Science in the University of Melbourne for research work carried out in this country at Woolwich.

The death is reported of Mr. A. S. Esslemont, late Controller of the Optical Munitions, Glassware, and Potash Production Department of the Ministry of Munitions.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Induchem, Finsquare, London.*]

THE COTTRELL ELECTROSTATIC RECOVERY PROCESS OF FLUE DUST AND FUMES.

H. J. BUSH.

Among the numerous methods employed for separating solid and liquid substances from gases holding them in suspension, the electrical precipitating process as evolved by Prof. Cottrell is destined to hold a leading place, and the following remarks are offered in the hope that they may help the readers of this journal to realise the great progress that has been made since the first tentative experiments twelve years ago, as well as the present extent of the field of application.

It may not be amiss at this point to state briefly the general principle of electrical precipitation. If a metallic plate is connected to one side of a source of high electrical potential, and a needle point connected to the other is brought opposite the plate, the air particles in the gap between the two will take up a charge of electricity. Any solid or liquid particles floating in the gap will do likewise and be attracted by the plate electrode, and further, the greater the potential difference and the higher the charge the more rapidly the particles will travel. We can picture to ourselves a stream of ions emanating from the fine point bombarding the particles in their path, imparting to them their electrical charge and thus causing them to migrate towards the plate electrode, on striking which their charge is neutralised. The needle point is now usually referred to as the discharge electrode, and the plate as the receiving electrode. Even if no visible solids are present the gas molecules behave in the same way, giving rise to an electric wind from point to plate.

In practice the necessary charge is produced by connecting a source of alternating current to the low tension terminals of a step-up transformer, the high tension terminals of which are connected to a mechanical rectifier. The rectifier changes the A.C. power supplied to it to one of unidirectional polarity and delivers it as such to the precipitator, the receiving electrode of which is earthed for safety as well as convenience.

When in 1906 F. G. Cottrell, who was then professor of physical chemistry at the State University of Berkely, California, U.S.A., was confronted with the problem of removing sulphuric acid mist from the gases of a Mannheim contact plant he bethought himself of the experiments carried out by Sir Oliver Lodge in 1885. He repeated them and became convinced that the method could be developed into a sound commercial process. After some tests in the laboratory with a bell jar as receiving electrode and a wire gauze as discharge electrode, an apparatus on a larger scale was set up at an acid works on San Francisco Bay. The gas at a rate of 200 cubic feet per minute was subjected to 6600 volts, and the results were very encouraging. This led to the installation at the Selby Smelting and Lead Company's Works in California of what was apparently the first commercial electrical precipitation plant. They had been troubled with dense sulphuric acid fumes from the parting kettles in which bullion is boiled with sulphuric acid to separate the silver from the gold. The precipitator to deal with these fumes consisted of a lead lined box in which lead plates were suspended as receiving electrodes, lead-covered iron rods fitted with asbestos or mica acting as discharge electrodes. The latter were insulated and the precipitator was connected to a source of unidirectional current of 17,000 volts. On passing the waste gases through the apparatus it yielded an acid of sp. gr. 1·38 at the rate of 2 gals. per minute. The plant has been in operation now for many years with considerable benefit to the proprietors.

Since then vast strides have been made and installations have come into existence which ten years ago would have been deemed chimerical. As an example of the latest development may be mentioned the Cottrell plant designed for the Anaconda Copper Company, the two leading-in flues of which have an area of 20×50 ft. each and the capacity of which is 3,000,000 cubic feet per minute with an estimated dust recovery of 240 tons per 24 hours.

Figures 1 and 2 illustrate diagrammatically the two types of precipitators most commonly used.

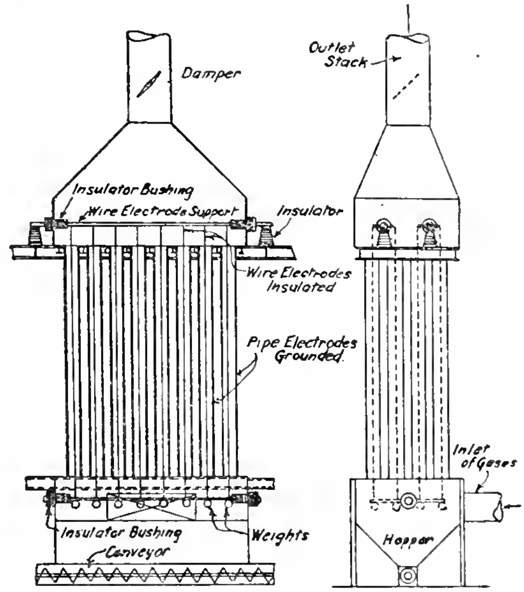

FIG. 1.

Fig. 1 shows the vertical or tube-and-chain construction in which the gases travel vertically through a tube-receiving electrode in the axis of which the discharge chain electrode is suspended. Fig. 2, the

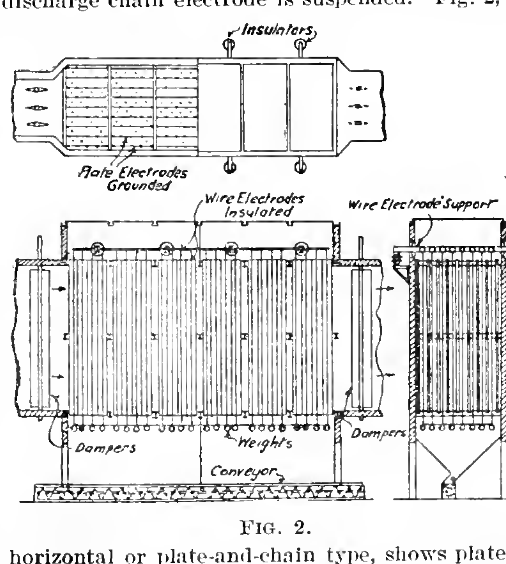

FIG. 2.

horizontal or plate-and-chain type, shows plates as receiving electrodes with chains hung between them as discharge members. The gases travel horizontally between the vertical plates.

In 1910 the Balaklala Smelter on the Sacramento River put in a precipitator using sheet iron receiving electrodes and wire discharge electrodes. The voltage has now risen to 30,000 and filtration tests on the cleaned gases show a recovery of over 90 per cent. of the solids. The gases treated are derived from copper reverberatories, convertors, and blast furnaces, the volume being 250,000 cubic feet per minute at 100° to 150° C., power consumption 120 K.W., and recovery 6 to 8 tons per day.

Other installations rapidly followed, *viz.*, at the Garfield Copper Smelter, Utah, for recovering the fumes from convertors blowing blister copper from a leady matte; and at the Consolidated Mining and Smelting Company, Trail, B.C., for recovering lead fume from the waste gases of lead blast furnaces.

Figure 3 (reproduced from the *Journal of the American Institute of Chemical Engineers*) shows a small model of a unit of the Trail Precipitator: it will be noted that the precipitator is arranged

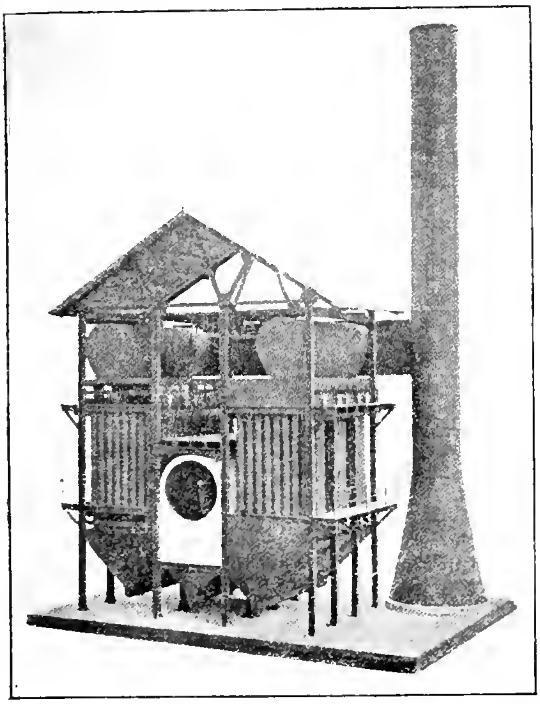

Fig. 3.

on both sides of the main flue, which makes a compact and solid construction. The gases pass through the pipes in an upward direction and from the top headers straight to the stack.

At the Anaconda Copper Company fractional precipitation is practised and oxide of arsenic containing over 99 per cent. As_2O_3 produced. The arsenical copper ores are roasted in mechanical furnaces and the hot gases passed through a Cottrell plant which takes out all dust carried over mechanically. The gases are then cooled by admission of air, causing the oxide of arsenic to condense and become amenable to collection in a second Cottrell apparatus.

The first tests on waste gases from rotary cement kilns were made in 1911 at the Riverside Portland Cement Works, Riverside, California. The company had already spent over one million dollars in connexion with methods for collecting the dust, law suits, purchasing orange groves exposed to the fumes, and so on. The experiments led to an installation for handling the gases from 10 rotary kilns, the volume being 1,000,000 cubic feet per minute and the temperature 400° to 500° C. The efficiency was at first 95 per cent., the dust collected amounting to nearly 100 tons per 24 hours. The discharge electrodes are wire and the receiving electrodes built-up wire screens. A year or two ago a pipe-and-chain type of precipitator was added and the recovery has risen to 99 per cent. In this type the receiving electrode is formed by a sixteen-foot pipe, on which a chain suspended axially acts as discharge electrode. The installation has been working since 1913 and forms an illuminating example of a plant put up to remove a nuisance proving an excellent and unlooked-for investment, in that the potash bearing material recovered found a ready market with the farmers and has in fact by now handsomely repaid the initial outlay.

After this progress was rapid, but as it is not possible to refer to all the installations since erected, attention must be confined to a few typical examples.

The International Smelting and Refining Company, Globe, Arizona, uses five Wedge roasters 22 ft. 6 in. in diameter to dry the flotation concentrates derived from a neighbouring mill. To recover the considerable quantity of valuable dust carried away by the drying gases they are passed through a Cottrell plant from which daily over 7 tons of dust running 25 per cent. copper is taken. The gas volume is 35,000 cubic feet per minute, the power consumption less than 20 K.W. and the efficiency practically 100 per cent., it being impossible to detect any fume escaping at the outlet of the precipitator. The same company decided by taking the waste gases, 270,000 cubic feet per minute at 150° C., through a Cottrell precipitator to dispense with the extensive ground space required for long flues and settling chambers in connexion with their five copper converters. The yield amounted to 2 to 3 tons per day containing 35 per cent. copper, the power consumption 20 K.W., and the efficiency 98 per cent.

At Tooele, Utah, the gases from Dwight-Lloyd sintering machines are treated, the dust consisting mainly of lead oxide. Tin oxide is recovered by the Goldschmidt Detinning Company of Chicago. The Hooker Electro-chemical Company of Niagara Falls uses the Cottrell process for removing the chlorine from the exit gases of its bleaching powder plant by spraying in finely divided lime and precipitating it subsequently electrically. Sugar dust was precipitated at the refinery of the Colonial and Hawaiian Sugar Refining Company, Crockett, California, and powdered egg and milk have been similarly dealt with in America.

An enterprising firm of explosives manufacturers has installed a Cottrell plant for recovering nitric acid from waste gases of nitrating operations. Stoneware pipes, acid-resisting brickwork and aluminium entered largely into the construction of this precipitator, the capacity of which is 22,000 cub. ft. per minute. Prior to entering the precipitator the gases are mixed with steam, and the precipitated liquor amounts to roughly 40 gallons per hour containing 35 to 42 per cent. HNO_3.

The first Cottrell plant in this country was erected in 1917 at one of H.M. Factories for the purpose of doing away with the considerable nuisance caused by the sulphuric acid in the waste gases of the concentrating furnaces, in which dilute waste acid from the nitrating department is brought up to 94 per cent. H_2SO_4. The spent gases from a battery of Gaillard concentrating towers, after passing through ordinary scrubbers, are collected in a common main and led to a Cottrell precipitator divided into four compartments each of which has a capacity of 16,000 cubic feet per minute,

the total volume to be dealt with being estimated at 48,000. Thus there is always one compartment idle and ready for immediate use in case one of three has to be shut off for purposes of inspection or repair. Suitable dampers arranged at the inlet and outlet of each compartment allow either one to be isolated from the rest. The gases are drawn through the precipitating chambers by means of a Davidson blower which induces the necessary draught in the brick-built outlet stack.

Owing to the size of precipitator required, it was decided to build the chambers in acid-proof masonry with removable lead-lined covers resting in lutes on the side walls. This allows of easy inspection and access to the electrodes. The latter consist of lead plates suspended vertically from the side walls acting as receiving members, and of specially shaped regulus discharge electrodes suspended from bus bars carried on insulators. Each of the four chambers is connected to a 10 K.W. high tension generating set consisting of 100,000 volt step-up transformer, motor, rectifier, and switchboard, there being five independent sets each of which can be connected to any of the four chambers. The current consumption per chamber amounts to 5 or 6 K.W., *i.e.*, a total of 576 K.W. per 24 hours. The electrical potential maintained between electrodes is 68,000 volts. The gases enter the precipitator at a temperature of 80° C. approximately, and the amount of acid recovered averages 25 tons of 50 per cent. acid per 24 hours. Owing to its having been found desirable to increase the gas volume taken through the concentrators above the estimated quantity of 48,000 cubic feet per minute, the precipitating chambers are overloaded and further additions are being provided. The plant has been in practically continuous operation since August, 1917, and apart from the value of the acid recovered has proved a source of great satisfaction to both management and operators. It has put a final stop to the most irritating and destructive acid mist which formerly descended from the individual outlet stacks of the concentrators.

At the present moment another of H.M. Factories is installing a Cottrell plant for the same purpose, and for still another Government-owned factory plans have been prepared for the erection of small independent precipitating units, each to be connected up to a battery of two Kessler furnaces. These small units will be built in lead instead of acid-proof masonry, and the draught of the present fans will be utilised.

The first application of the Cottrell process to metallurgical work in this country is claimed by the Thames Metal Company of Northfleet. The company has hitherto used a bag house to recover oxides of arsenic, tin and zinc carried away by the furnace gases, but owing to the increasing difficulty of obtaining material for the filter bags, it was decided to instal a Cottrell plant in a corner of the bag house; the results proved so beneficial in more ways than one that, within a week of starting up, orders were given to increase the electrical precipitation plant by 200 per cent. and to scrap the remaining bag filters. In this case the precipitator consists of pipes of sheet metal with chains axially suspended in them and the dust laden gases, entering by a lower header constructed in concrete, pass upwards through the pipes and out to atmosphere. The pipes are hammered mechanically from the outside every three hours to remove the coating of oxides clinging to the inside, and the material falling into the hopper shaped bottom header is removed periodically by a screw conveyor.

At this installation the voltage is maintained at 80,500. The Thames Metal Company counts among the advantages effected by the new plant the facts that the fan can be run at a lower speed, and that the valuable ground space formerly occupied by the extensive bag house has been saved. Another advantage is that the operators do not have to touch the material with their hands; this could not be avoided so long as filter bags were used.

Attention has also been given to the cleaning of blast furnace gases by the Cottrell process, and tests are now being conducted in conjunction with a firm of pig iron and steel producers, which it is hoped will lead to a satisfactory solution of a problem the difficulties of which are as peculiar as they are fascinating to those conversant with electrical precipitation.

SOCIETY OF CHEMICAL INDUSTRY.

FORMATION OF SUBJECT GROUPS.

At the meeting of Council held on October 24, a resolution was passed sanctioning the formation of a Chemical Engineering Group. The lines upon which this subject group will be framed are essentially those already described in these columns (this J., 1918, 296 R), but certain modifications have been introduced, securing to the Society, *inter alia*, the prior right to publish papers read before the Group, and providing for communication between the Group and the secretary of the Local Section in the area in which the Group may propose to hold a conference. A small committee, consisting of representatives of the Council and of the Provisional Committee of the Group, was appointed to discuss the necessary details of the rules, and to draft any new by-laws of the Society that may be necessary or desirable, bearing in mind the possibility of the formation of other subject groups in the future.

NEWS FROM THE SECTIONS.

SYDNEY.

The annual meeting was held in the Royal Society's Hall on May 15, Mr. Henry G. Smith, chairman of the Section, presiding. After the report for the session had been read (this J., 1918, 357 R), Mr. Smith announced the election of the following officers for 1918-19:—Chairman, B. J. Smart; Vice-chairman, H. G. Smith; Hon. Sec. and Treasurer, S. E. Sibley; other members of Committee, R. W. Challinor, F. A. Coombs, Prof. C. E. Fawsitt, A. B. Hector, G. I. Hudson, H. V. Nicholls, A. D. Ollé, Prof. Read, T. Steel.

The retiring chairman then read a paper on the "Grass Tree" resins of Australia, and the possibility of manufacturing picric acid from them. The fourteen varieties of "grass tree" (*Xanthorrhœa*) found in Australia are distributed irregularly, and some of them are of considerable size. The yellow resin from *X. hastilis* is most in request, and it has been collected from time to time in considerable quantities in New South Wales. This species is not now nearly so plentiful as it was, because the "grass trees" grow so very slowly, and when once cut down in the process of collecting the resins the tree is destroyed. Most of the resins from the other species are red in colour, some of them being very dark.

It was found that a fairly constant percentage of picric acid could be obtained from resins collected from the same species growing in localities wide apart. The greatest yield of picric acid formed from any of the resins was 50 per cent. with the product of *X. hastilis*; *X. Tateana* gave 46 per cent., *X. Preissii* 23 per cent.; a species common in Queensland 23 per cent.; *X. australis* from Tasmania 18 per cent.; a narrow leaved form growing

in the Ranges in the interior of New South Wales 18 per cent. With a red resin from (?) *X. arborea* only 5 per cent. of picric acid was formed. It was found necessary to use at least 12 parts by weight of nitric acid to one of resin, so that the quantity of acid required to be used would be considerable, and about six times the amount necessary to obtain the same weight of picric acid from phenol. Grass Tree resins are used in the preparation of spirit lacquers, varnishes, sealing wax, and for similar purposes.

Prior to the war steady shipments of "Grass Tree Resin" went forward from Australia to Europe; in the six years prior to 1915, 1831 tons of gums and resins were shipped to England of an average value of £8 per ton, and 4826 tons to Germany of an average value of £7 6s. per ton. The greater proportion of this was "Grass Tree Resin." There are in Australia very large quantities of "Grass Tree Resin" available, for which other uses may eventually be found, and although the commercial manufacture of picric acid from at least two of the resins would be possible, the cost would be greater than if made from phenol.

Mr. E. Elliott then read a paper on the "Uses and Manufacture of some Commercial Starches," the discussion of which was postponed till the next meeting.

EDINBURGH.

At the opening meeting of the session held on October 15, Mr. D. B. Dott, chairman, gave a short address on "The Influence of Philanthropy on Trade and Manufactures," with special reference to the suppression of the Indian opium trade with China, and to the severe restrictions on the export of morphine and some other alkaloids to China and Japan. Although the export of opium to China and its use in that country (except on medical prescription) were to cease entirely in 1917, large tracts of land in some of the Chinese provinces are under cultivation for opium, while smuggling and clandestine dealing in the drug are rife. The law by which no morphine or the like can be exported to Japan without a permit approved by both Governments has brought that particular trade virtually to an end. This regulation obviously operates in the direction of encouraging Japanese manufactures at the expense of British. Philanthropic agitators appear to forget that a very large amount of opium and morphine is needed for the legitimate requirements of an Eastern population of 450,000,000. Besides the primary purpose of relieving pain, these drugs are needed in the treatment of diseases which are much more prevalent in China than in England. In other words, the amount required per head of the population is much greater than is needed in Britain. It is suggested that no special legislation interfering with a particular trade should be passed, unless the need for such is patent and clamant, and that there is clear evidence that the proposed measures will be effectual for the purpose intended.

Mr. Dott also contributed a note on "The Surface-decay of Building Stone," in which he dwelt more particularly upon the action of the sulphur acids present in the air, the amount of these in urban areas having increased considerably of late.

In a paper on "A New Bleaching Powder for Use in Hot Climates," presented by Dr. T. J. Rettie and Professors J. Lorrain Smith and J. Ritchie, it was stated that at 98° F. (37° C.) bleaching powder lost 96 per cent. of its efficiency, measured as available chlorine, within 8 weeks, and at 113° F. (45° C.) the same loss occurred in a fortnight. The decomposition was traced to the contained moisture, the removal of which *in vacuo* over sulphuric acid involved a considerable loss of available chlorine; but the dried powder kept better than the moist. The difficulty was overcome by mixing freshly ignited quicklime with the commercial powder. Such a mixture lost 3—10 per cent. of its available chlorine at 45° C. in 3 months, compared with 3 weeks in the case of unmixed powder. It was further found that the presence of quicklime inhibits the formation of calcium chlorate, the presence of which in water sterilised with bleaching powder causes a bad taste. The amount of quicklime required is, as a rule, 10—15 per cent. in excess of the quantity calculated. In a typical experiment it was found that when 70 parts of a bleaching powder containing 34 per cent. of available chlorine and 9·7 per cent. of water were mixed with 30 parts of quicklime, a dry product containing 23 per cent. of available chlorine was obtained, which, after exposure in a sealed tube to 45° C. for 15 weeks, assayed 22 per cent. available chlorine. There was 0·52 per cent. of chlorate at the beginning and 1·2 per cent. at the end of the experiment. The fact that in Alexandria (Egypt) a bleaching powder of 11 per cent. available chlorine is considered fairly good quality, shows the possibility of the use of this method. A quicklime-bleaching-powder mixture would probably save half the freight and give double the chlorine.

YORKSHIRE.

On October 21, at Leeds, Mr. F. W. Branson read a paper on "Some Aspects of the Scientific Glassware Industry." As the result of numerous experiments it was found that a batch containing 6·5 per cent. alumina, about 8 per cent. zinc oxide, and about 7 per cent. boric oxide gave a satisfactory glass for scientific purposes, provided the silica and alkali were present in the best proportions. The standardisation of hollow scientific glassware and the elimination of unnecessary intermediate sizes had been the subject of a report presented to the Department of Scientific and Industrial Research, and it had been recommended that the 40 sizes of plain beakers listed four years ago should be reduced to 21. Mr. Branson now recommends that a committee representing technical societies be formed to secure the deletion of unnecessary sizes of hollow glassware, both ungraduated and graduated, and that fuller advantage be taken of the testing facilities offered by the National Physical Laboratory. The author then gave a demonstration of English's method for the rapid calibration of graduated vessels.

Mr. W. McD. Mackey, who presided, announced that Mr. B. A. Burrell had been appointed Hon. Secretary and Treasurer of the Section in succession to Mr. T. Fairley, who is now a Vice-president of the Society.

LONDON.

M. Paul Kestner, President of the Société de Chimie Industrielle, will deliver an address on "The Alsace Potash Deposits and their Economic Significance in relation to Terms of Peace," at the rooms of the Royal Society of Arts, John Street, Adelphi, on November 4, at 7.30 P.M. M. Kestner is being entertained at luncheon on that day by the Society of Chemical Industry, and the company will include Lord Moulton, Lord Burnham, Sir Robert Hadfield, Sir Alfred Mond, Sir Arthur Churchman, Sir Charles Parsons, Sir Alfred Keogh, Sir Boverton Redwood, Professors Louis, Pope, Armstrong, Dr. Keane, the Sheriffs of the City of London, and several manufacturers representative of the chemical industry. The guests are invited by the Lord Mayor to tea at the Mansion House in the afternoon.

MEETINGS OF OTHER SOCIETIES.

THE CERAMIC SOCIETY.

Prof. C. H. Desch, of Glasgow, read a paper on the setting of plaster at the opening meeting of the new session at Stoke-on-Trent on October 12.

Le Chatelier's well-known explanation was referred to, the interlocking of the radiating groups of crystals being recognised as at least one of the causes of the strength of plaster after setting. Lowry and Hemmings have lately shown that the caking of certain commercial salts, which often gives trouble in packing, is due to the same cause.

All recent work on metals tends to show that boundaries between neighbouring crystal grains in a mass of pure metal or homogeneous alloy are surfaces of strength, not of weakness. This may be due to surface tensions, as suggested by Beilby, or to an amorphous layer of the same chemical material between the surfaces of the crystals, as Rosenhain proposed. Plaster being porous after setting, the contact between the spherulites is less complete than in cast metal. Probably the lath-shaped crystals are actually in contact along only a part of their length.

The reconversion into gypsum of the hemihydrate, $2CaSO_4,H_2O$, is associated with a decrease of volume, amounting to about 7 per cent. of the total volume of hemihydrate and water which combine. The mass as a whole expands just as it sets, which Davis attributed to dimorphism. The author prefers to consider the expansion as arising from the outward thrust of the lath-shaped crystals during growth, a view more in accordance with the porosity of the plaster after setting.

Freshly burned commercial plasters often contain a little soluble anhydrite, which, however, readily absorbs moisture from the air to form the hemihydrate. When soluble anhydrite sets, a small expansion takes place.

The German flooring plaster (Estrichgyps) hardens too slowly to be useful for moulding, but the product is hard, and resembles cement more than plaster. It is usually burned at or above 900° C. At a red heat some basic sulphate is formed, which may take part in the hardening.

Recent work suggests that the supposed modifications of anhydrite are largely due to differences in the fineness of the particles. Gill has lately shown that finely ground natural anhydrite and dead-burnt plaster, covered with water in closed bottles, and left for seven years, were very largely changed into gypsum crystals; so both these substances can set.

If the porosity of plaster be due to the outward thrust of growing gypsum crystals, it would be favoured by rapid crystallisation from a supersaturated solution. For rapid solution of the hemihydrate it must be finely divided: this is best accomplished by fine grinding of the gypsum before burning. For quick setting, a little gypsum should be present in the finished plaster.

The fifth meeting of the Refractory Materials Section, held at Swansea on October 17 and 18, furnished the customary full programme of papers and discussions, etc. The general distribution of refractory materials—silica rocks, fireclays, and dolomitic limestones—in South Wales, was described in a paper by Mr. J. A. Howe, who also pointed out that there were possibilities of valuable supplies being obtained from deposits at present unworked. Mr. Crook's paper on "Magnesite as Raw Material" dealt in a comprehensive manner with the properties and characters of different deposits, the best means of making use of them, and economic considerations and statistics. Fire bricks were the subject of practically four different papers. Mr. G. W. Mottram discoursed on bricks made wholly or mainly of non-plastic materials, advocating the grinding together of the clay, lime, or other binder with a portion of the grog (in the case of fireclay bricks) or the silica (in the case of silica bricks) before mixing with the rest of the non-plastic material. Dr. A. Bigot's paper was concerned with silica products used in the Siemens-Martin or similar furnaces. A paper by Dr. J. W. Mellor and Mr. W. Emery recorded valuable work done in connexion with the action of flue dusts and certain other dusts on firebricks of different types. It was found that penetration by dust is generally greater in fireclay bricks than in silica bricks, and that the bond is usually attacked first, and the coarser grains last. The finer the grain of silica bricks, the less the depth of penetration by the dust generally. Iron oxide does not materially corrode silica bricks under oxidising conditions, but under reducing conditions ferrous silicate is formed and acts as a corrosive flux. The dusts seem to help the conversion of quartz into a low specific gravity form (or forms) of silica. The report on "Standardisation of Tests for Refractory Materials (Part II.)," presented by Dr. Mellor, dealt with proposed tests for the grading of clays, etc., according to the size of grain, and the corrosive action of flue dusts on refractories.

Zirconia was the subject of a paper by Mr. H. C. Meyer, which contained much useful information, although little which could be called really new. In the discussion, Mr. H. E. Coley described the progress made in the commercial production of pure zirconia in this country, and incidentally deprecated the registration of the word zirkite (the mineral) as a trade name, an opinion which was cordially endorsed by other speakers. Professor Fearnsides bore witness to the failure under load of zirkite, and Dr. Mellor stated that a sample of the oxide made in this country was found by him to be superior to the pre-war German product.

The paper on "Refractories in the Zinc Industry," by Mr. J. A. Audley, was mainly concerned with the changes which take place in the materials of the retorts under the very severe conditions to which they are subjected in zinc furnaces; several suggestions for possible improvements were offered. Among the many points brought out in the discussion, by Mr. H. M. Ridge and others, were the facts that the average life of a retort under present conditions is about twenty days, that the extremes of temperature to which a retort is subjected are about 650° and 1450° C., and that the use of magnesia as retort substance was tried and abandoned in Silesia. Considerable dissatisfaction was expressed as to the quality of the fire bricks used in the construction of the furnaces; their defects were mainly due to insufficient firing and to a deficiency in grog.

In reviewing the position of the Welsh silica brick industry, Mr. W. J. Jones, chairman, stated that the output had increased by over 75 per cent. in the period July, 1916, to November, 1917, and owing to the extremely low cost of winning and to the very favourable facilities for transit and export, he looked forward to a further extension of the industry. The main defects of the Welsh silica brick works were the comparatively small size of the units and the lack of combination among manufacturers. He advocated an extension of scientific investigation, and pointed out that there was a large field to be explored in connexion with the manufacture of bricks and blocks for the construction of spelter roasting and smelting furnaces. In regard to the steel industry, he mentioned that the British ingot capacity would shortly be 12 million tons per annum, compared with the pre-war figure of 7½ million tons.

NEWS AND NOTES.

UNITED STATES.

ANNUAL MEETING OF THE AMERICAN CHEMICAL SOCIETY.—At the annual meeting held in Cleveland, Ohio, during the second week in September, especial attention was devoted to the dye and potash industries. A symposium was held on each of these subjects and the progress made was well emphasised by statistical data. It appears that the work done since 1914 is quite equal to that completed after two decades of work in Germany.

The names of three honorary members of the Society, Professors W. Nernst, W. Ostwald and Emil Fischer, were struck off the rolls, and the action was made retrospective as from August 1, 1914. The reasons given were stated in resolutions laid before and unanimously adopted by a general meeting of the Society.

The Council passed resolutions recognising the important work of the Women's League for the conservation of platinum which has done so much towards educating the people to the need of platinum for war purposes.

An important report was made by the Rubber Section relative to the diseases arising from the use of organic accelerators in the rubber industry, their detection and methods of treatment. Special attention was drawn to the danger of marketing organic accelerators under misleading trade names, and this report will be printed in full very shortly. Symptoms and antidotes are given in detail as well as general advice regarding the use of these materials.

The report of the committee on chemical import statistics was submitted, and will be issued shortly to the general public. Twenty thousand import invoices of chemicals have been examined and the data indexed to give the name of the chemical or material of or for the chemical industry, the quantity imported, the total value, and the countries of origin, arranged in the order of their participation, and showing the percentage of such participation. In this important work the Bureau of Foreign and Domestic Commerce, the Geographical Survey, the Bureau of Chemistry, and the Tariff Commission, have co-operated with the American Chemical Society. A committee has been appointed to continue this work, and it is expected that data of great value will be made available to chemical manufacturers.

During the proceedings it was brought out that more than 15,000 chemists have been listed and classified by the American Chemical Society with the object of assisting in their proper allocation to the Government services and to industries. There are now over 1400 graduate chemists in the chemical warfare service. The necessity of increasing the supply of college-trained men was the subject of discussion. Special courses of intensive study for high school graduates have been arranged: a one year course, which is expected to turn out students able to do routine work under supervision, a two year course for more specialised work, and a three year course for training in research.

A NEW GOVERNMENT LABORATORY.—The Government has established a laboratory where particular attention is to be given to industrial processes, dye intermediates, dyes, medicinals and analytical methods. The laboratory contains plant for work on a semi-commercial scale, and it is expected that much important work will be done, particularly with regard to colours that may be used in foods. The identification, analysis, and physical effect of colours in foods, including the behaviour of colours in masses, will be studied on both the laboratory and the manufacturing scales.

SUGAR CONSUMPTION OF INDUSTRIES IN THE U.S.A.—Statistics compiled by the United States Food Administration show a total annual industrial consumption of 972,125 tons of sugar, of which quantity about 36 per cent. is used for confectionery, nearly 14 per cent. for soft drinks, 10 per cent. for condensed milk, 1·2 per cent. for proprietary medicines and pharmaceutical preparations, and none for brewing.

SOUTH AFRICA.

INDUSTRIAL DEVELOPMENTS.—*Natal.*—The manufacture of anhydrous ammonia has been started at Durban.

Transvaal.—The blast furnace erected by the Pretoria Iron Mines, Ltd., was blown in on July 15 last.

Capetown.—Pig lead, produced in Rhodesia, is now being sold in the Union, and large quantities have already been disposed of in the Cape.

Witwatersrand.—A second company, with works at Newtown, has been formed to manufacture calcium carbide. In addition to carbide, a production of 1 ton per day of electrodes is anticipated.

VELVET BEANS.—Chemical examination at the Imperial Institute of velvet beans (*Mucuna deeringiana*) grown in South Africa shows them to possess a high food value. They contained: Crude proteins 24·2% (true proteins 20·7%), fat 6·3%, starch, etc. (by difference) 52·2%, moisture 8·3%. In view of the successful experiments conducted in Florida, U.S.A., the Institute authorities have little doubt that they would be a valuable feeding stuff for animals.

INDUSTRIAL ALCOHOL.—A Sub-committee of the Scientific and Technical Committee has recommended that industrial alcohol containing ether and intended for use as a motor spirit should be further methylated as follows:—One hundred gallons of motor fuel to contain at least 0·5 gall. of pyridine bases and 2 galls. of crude methyl alcohol, together with an additional gallon of either crude methyl alcohol or benzol for every 10 galls. of ethylic ether in 100 galls. of the fuel. Another recommendation is to the effect that non-duty-paid spirits be distilled and the ether manufactured in the same building.—(*S. Afr. J. Ind., Aug.*, 1918.)

CANADA.

DISCOVERIES OF MANGANESE.—The manganese ore deposit discovered in the Cowichan Valley, Vancouver Island, is regarded hopefully. One of the largest deposits assayed over 50 per cent. of metal, 12 per cent. of silica and no phosphorus. A discovery of manganese ore near Cape Blomidon, Nova Scotia, is also reported.

THE METAL INDUSTRY IN ONTARIO.—As a result of high mining costs, together with increased freight rates and smelter charges, copper mining has become unprofitable. The only shipper was the Hudson Copper Co. at Havilah. Nickel-copper mining and smelting, however, show an increase in output. The Canadian Copper Co. has been absorbed by the International Nickel Co. of Canada, Ltd., and the new refinery, located at Port Colbourne, began operations in July. From the Creighton mine ore is being raised at the rate of over 100,000 tons per month. During the half-year January-June, 1918, 804,640 tons of ore were raised from the operating nickel-copper mines. Ore smelted was 717,119 tons, producing 40,178 tons of nickel-copper matte. The pig iron produced in the half-year shows little change in quantity, but an increase of over 50 per cent. in value. The eight

furnaces in blast smelted 75,716 tons of Ontario ore and 601,751 tons of foreign ore. The steel produced in the period was 432,326 tons. The production of molybdenite shows a small decline.—(*Bd. of Trade J., Oct.* 10, 1918.)

GENERAL.

The Whitley Scheme and the Chemical Industry. One of the chief proposals of the Whitley Scheme is the establishment of Industrial Councils, District Councils and Works Committees to prevent, or to settle expeditiously, disputes arising between employers and employees. As expedition has not been a distinguishing feature of the existing Government Committee on Production, which has a similar function, the Chemical Industrial Council has initiated the appointment of a special committee to undertake the prompt investigation of incipient troubles. The committee will consist of six members of the Council, three representing the employers and three the workers, who will be appointed monthly and by rotation. These "special commissioners" will be ready at a moment's notice to proceed to any place where a question has arisen which the Works Committee or the District Council has not been able to solve.

Inter-Allied Conference of International Scientific Organisations.—At a conference of delegates from Great Britain, Belgium, France, Italy, Japan, Serbia, the United States, and Brazil, held at the Royal Society on October 9-11, a statement was adopted unanimously to the effect that the Allied nations will not resume personal relations in scientific matters with their enemies until the Central Powers can be re-admitted to the concert of civilised nations. The statement is intended to serve as a preamble to a number of resolutions dealing with the withdrawal of the Allied nations from existing international associations and the formation of new ones to take their place.

Sulphuric Acid and Nitre Cake.—The Acids Supply Branch of the Ministry of Munitions exercises direct and complete control over the importation, production, distribution and rationing of the raw materials used in the manufacture of sulphuric acid and the more important fertilisers. As prices and costing also come under its purview, the trade may now be said to be operated on a commission basis, and quite independently of the ordinary economic factors which govern prices and distribution. Sulphuric acid is being manufactured at the rate of about 1,800,000 tons per annum, and the principal raw material, iron pyrites, is being imported from Spain and Norway. Much economy has been effected by the use of nitre cake, which was formerly thrown away, in some cases at a cost of £1 per ton for discharging into the sea or dumping on land. The estimated production of this by-product is about 28,000 tons per month, of which some 23,000 tons per month is consumed in 25 different trades. The non-cupreous de-sulphurised residues from iron pyrites are shortly to be utilised in iron manufacture, and plants are being erected for treating some 300,000 tons.—(*Bd. of Trade J., Oct.* 3, 1918.)

Alcohol Motor Fuel Committee.—The Secretary of State for the Colonies has appointed the following Committee to investigate the available sources of supply of alcohol, with particular reference to its manufacture from materials other than those which can be used for food purposes, the method, cost of such manufacture, and the manner in which alcohol should be used for power purposes:—Sir Boverton Redwood (Chairman), Major A. Cooper-Key, Mr. Arnold Philip, Mr. H. F. Carlill, Prof. C. Crowther, Dr. J. H. Hinchcliff, Sir Fred. Nathan, Mr. H. W. Garrod, Sir H. Frank Heath, Sir F. W. Black, Prof. H. B. Dixon, Brig.-Gen. Sir Capel Holden, Dr. W. R. Ormandy, Mr. H. Wyatt, and Mr. E. S. Shrapnell-Smith as Secretary. (Office of H.M. Petroleum Executive, 12 Berkeley Street, W. 1.)

German Chemical Industry and the War.—"L'Industrie Allemande et La Guerre" is the title of a recent special number of *Chimie et Industrie* (49, Rue des Mathurins, Paris. 6 frcs.), which contains a valuable account of the German chemical industry immediately before the war and during the war, together with interesting deductions concerning the probable trend of events after peace has been signed. As the narrative is too lengthy (pp. 82) to admit of a satisfactory abstract, those interested must be referred to the original.

British Association of Chemists.—At a meeting of the Leeds and Bradford Section held in Leeds on October 11, Mr. B. Hickson presiding, the draft regulations of the Association were discussed and approved with only two modifications. It was thought that teachers of chemistry should be eligible for admission, and that in regard to the second of the declared objects of the Association the words "British Empire" should be substituted for "Great Britain and Ireland." Mr. B. Watmough (Wakefield) emphasised the desirability of the Association working in complete amity with the Institute of Chemistry, and urged members to apply for registration by the latter if they were eligible. In explaining the proposed qualifications for membership of the Association, the chairman said that a pass degree fortified by three years' practice would rank equally with a first or second class honours degree, and he expressed his confidence that any applicant possessed of a good general education and not less than seven years' experience would obtain admission. The meeting also approved of the proposed issue of an official record of the proceedings of the Association six times a year.

Restoring the Lens Mines.—In an article on the restoration of the Lens coal mines M. Basly, Deputy for the Pas de Calais and Mayor of Lens, states that the work required is tremendous, necessitating the use of a considerable amount of material and lasting several years. The Lens basin produced annually not less than three million tons of coal, and its restoration is therefore a matter of capital importance. The mines are full of water. The Government has just consented to an advance of two million francs (about £80,000) to the three companies of Lens, Courrières and Liévin. This sum will cover the initial expenses for mining appliances.—(*Petit Parisien, Oct.* 4, 1918.)

Italian Gas Works and Coal Shortage.—The difficulties in marine transport due to the war have produced a grave crisis in the gas industry of Italy. Many small gas works have had to close down for want of coal, whilst the large gas works have had to suffer a gradual reduction of supplies. Coke might have been largely employed, but the Vado Ligure coke ovens have only been working half time, although equipped to recover by-products. 80,000 tons of coke has been imported from England through Genoa and Savona.—(*Coll. Guard., Sept.* 6, 1918.)

Nationalisation of Industries in Russia.—After prolonged preparatory work the following industries have now been taken over by the State: Coal, iron, copper, platinum, silver, tin, lead, zinc, asbestos, salt; engineering works; the textile industry; the electro-chemical industry; saw mills; the tobacco, glass, ceramic, milling, leather and cement industries; further, gas works, tramways, canals, privately-owned railways, and all factories and undertakings of large or medium size hitherto under private management which have any national importance.—(*Z. angew. Chem., July* 16, 1918.)

Present State of Russian Industries.—The latest information concerning the industries of Greater Russia is in accordance with the views of the most pessimistic. The *Sarja Rossijii* affirms the complete destruction of the starch industry in the Government department of Rjasan. The factories which were in part destroyed remain idle, and the peasants have taken possession of the stocks of materials. All industry in the Urals is carried on under great difficulties. In the district of Bogeslewisk the monthly output of iron ore has dropped from 250,000 puds to 200,000. In the Lylyswenski district, where 21,000 workmen were employed, not more than 4000 are now working. At Tschusowslosawod, an iron-producing district, all the furnaces are out of blast. In Werchniisetzke likewise all the factories are idle. State help has been given to the industries of the Urals, without, however, any visible effect in improving the situation.—(*Z. angew. Chem., July* 12, 1918.)

Ceylon Graphite Industry in 1917.—After about a year of stagnation the industry became active towards the end of 1915. This activity continued throughout 1916, which was a record year, the output being 33,400 tons valued at £1,500,000. The year 1917 commenced with every prospect of similar prosperity, the demand was brisk, high prices were ruling, and the Government was asking for an increased output. During the first 6 months, 13,000 tons was exported, realising £800,000, but during the latter half of the year prices dropped, and by the end the demand had practically ceased. The smaller mines have in consequence been shut down, although the larger ones are continuing work and accumulating stocks. There were 1288 mines working during the first 6 months, but only 764 during the second.

Over 3000 new enterprises have been registered during the year, but no new valuable deposits have been discovered. Several abandoned workings have been restarted with good results.

The output of plumbago depends entirely on the demand and ruling prices; while these are favourable, there is every possibility of a yearly production of 30,000 tons for several years.

The present state of the industry is decidedly bad, and very little can be done to mend matters until markets improve. When this occurs, the exploitation of new lands should be taken in hand, with a view to finding new deposits to take the place of the present mines as they become exhausted.—(*Bd. of Trade J., Aug.* 29, 1918.)

The fall in production during the latter half of 1917 was chiefly due to the lessened demand on the part of American importers, who in 1916 took more than 80 per cent. of the total Ceylon output.—(*U.S. Com. Rep., Aug.* 9, 1918.)

Madagascar Graphite Industry.—During 1917 this French colony exported over 33,000 tons of graphite, the total quantity being divided almost equally between France and England. It is estimated that 8000 tons of the French portion was re-shipped to the United States (*cf.* this J., 1918, 310 R). At the present time exports to both France and United States are prohibited, except under licence, and although the French Ministry of Armaments has promised to give careful consideration to American demands there does not seem much prospect of any large amount of Madagascan graphite going to America during the present year. As a consequence of the prohibition of exports, mining operations are being greatly curtailed. Shipments continue to go forward to England at the rate of about 1500 tons per month.—(*U.S. Com. Rep., Aug.* 16, 1918.)

Alcohol from the Sotol Plant.—This plant, which grows wild in large quantities in Mexico, is already being utilised in the manufacture of prepared cattle food. The proposed manufacture of alcohol (this J., 1918, 282 R) in Ciudad Juarez has been delayed, and only 100 barrels has as yet been made; it is expected, however, to have the distillery in full operation by the middle of August.—(*U.S. Com. Rep., Aug.* 7, 1918.)

The Sugar Industry of the Ukraine.—Of the 314 factories of what was formerly Russia, 68 per cent. are in the Ukraine. The outbreak of war reduced the production to about one-half, and the stocks to about one-third. The production of the rest of Greater Russia is now very small. In a few months the socialistic rule has brought about a famine, and the cultivation of beet in the Ukraine has suffered. Much of the land has been seized, so that the supply of beet has been almost stopped. The price of sugar has in consequence risen nearly fifty-fold compared with pre-war prices. Within the last few days Ukrainian sugar has been sold in Magdeburg at Mk.6·20 per kilogram. The failing imports are severely felt in Germany.—(*Chem.-Zeit., Aug.* 24, 1918.)

Netherlands Beet-Sugar Industry.—Sugar has been produced from beets in the Netherlands for more than a century, but it was not until 1870 that the prosperity of the industry was fairly established. Since that year, continued progress has been made.

In 1870, about 16,000 acres were planted with sugar-beets and eighteen sugar factories produced 11,000 metric tons of sugar. By 1916, the area had increased to 160,000 acres, the number of factories to twenty-eight, averaging ten times the capacity of those of 1870, and the production of sugar to 247,209 tons. In 1917, the area under cultivation was reduced by a State Law to 116,000 acres, owing to war conditions. The output of sugar in 1917 is not yet officially published, but it probably reached 160,000 metric tons, which is equal to the annual Dutch consumption.

The sugar content of the beet has ranged from 15·5 to 16·8 per cent. in different years, while the average yield of sugar per hectare has varied from 4·2 to 6 metric tons.

The exports of sugar from Holland just before the war and up to 1915 varied from 100,000 to 150,000 tons per year, most of which went to England. In 1916, the quantity fell to 70,000 tons, and in 1917 to 30,000 tons.

In the early years of beet cultivation farmers objected that their soil was unsuitable, but generous fertilising with artificial manures proved successful. Help was also given by the Government in the form of premiums and of excise taxes on sugar.—(*U.S. Com. Rep., June* 29, 1918.)

Japanese Black Mint.—The Japanese black mint plant, from which menthol is obtained, is cultivated in two widely different climates. Some 92 per cent. of the total production is grown in the northern island (Hokkaido), which has an average yearly rainfall of about 38 ins. and mean summer and winter temperatures of 60° F. and 22° F. respectively. The remaining 8 per cent. is grown on the main island (Okayama and Hiroshima) where the rainfall is 42·5 ins. and the average temperatures 75° F. and 38° F.

The mint requires a light, well-drained soil. The roots are planted (in Hiroshima and Okayama) at the end of November and the beginning of December. The plant attains its full growth during the summer months, and is cut in the latter part of July, during August, and in the early part of September, three cuttings being made during the season. The third cutting yields the greatest percentage of oil and menthol crystals. The leaves are steamed and pressed in barrels by the planters,

who then ship them to the menthol factories, of which there are 74 in various parts of Japan. There the oil is extracted from the leaves by a process of freezing and pressing.

Attempts have been made at various times to introduce the living plants from Japan into the United States, but so far unsuccessfully, as they cannot stand the voyage. Measures are now being taken to obtain the seeds, but these are very scarce, as the plant is usually propagated from root cuttings.—(*U.S. Com. Rep., May* 7, 1918.)

Talc and Soapstone in the U.S.A. in 1917.—The sales of talc in the United States in 1917 amounted to 198,613 tons, an increase of 3 per cent. over the previous year. Previously, the chief producer was New York, but in 1917 Vermont took the premier place for quantity but not for the value of the material. The most expensive talc, including that used for gas-tips, pencils and insulators, was produced in about seven times the quantity of any previous year. The quantity of imported talc was less than one-tenth of the domestic consumption in 1917, but most of the imported product was of high grade. The greater part of it was imported from Canada and Italy, the latter country supplying the talc used for toilet powder, whilst the material used for cutting was supplied chiefly by Sweden, Spain and India. Soapstone is a massive rock composed largely of talc, the most valued quality being that in which the grains interlock. It is used in the manufacture of laundry tubs, laboratory appliances and fittings, and for general insulation purposes on account of its resistance to acids, heat and electricity. The whole of the American output of 20,000 tons in 1917 came from three mines in Virginia, where it occurs in a form permitting large slabs of it to be obtained.—(*U.S. Geol. Surv., July*, 1918.)

Gypsum in the U.S.A. in 1917.—The quantity of crude gypsum mined in the United States in 1917 was slightly less than in the previous year but greater than in any year before 1916, and amounted to $2\frac{3}{4}$ million short tons. The value was 32 per cent. greater than that of the previous year, owing chiefly to higher wages and cost of supplies. A large quantity of crude gypsum was sold as a retarder for Portland cement. More than one-third of the gypsum sold as land-plaster was marketed by the plants in Virginia. Keene's cement was made in Kansas, Texas and Utah. The calcined gypsum sold to plate-glass factories was produced chiefly in Michigan and Ohio, the price in 1917 being double that of the previous year. Plaster board, tiles and blocks were made at 19 works in 12 States, about 137,000 tons being used for these purposes; one new works was opened. The gypsum imported into the United States in 1917 was almost exclusively from Nova Scotia and New Brunswick, chiefly in the form of white alabaster. A considerable proportion of the dental plaster produced is made from Canadian gypsum. The principal exports were plaster of Paris to Canada, Cuba and Brazil, together with small amounts to almost all parts of the world, and plaster board to England, Canada, Cuba, Argentina, Chile, India, South Africa, and Japan. Canada and Japan took more than half the total amount of plaster board exported. In Canada, many thousands of tons of gypsum plaster was used for roofs for Government buildings in connexion with the war, and by surgeons. Many of the military buttons have a plaster basis. Less known uses are for moulding abrasive wheels, as a binder for concentrates and dust in copper smelting, for cleaning wool, distempering, blackboard chalk and other crayons.—(*U.S. Geol. Surv., July*, 1918.)

Imports of Tin into the United States.—The total imports of metallic tin in the year ending June 30, 1918, were 69,731 tons gross, as compared with 67,529 tons in the fiscal year 1916, and 44,722 gross tons in 1914. It is interesting to note that whilst in 1914 the American imports of tin from the United Kingdom and from the Straits Settlements formed 90 per cent. of the total, in 1918 they amounted to only 55 per cent. of the total. The difference was compensated for by heavier shipments from Bolivia, China, Australia and the Dutch East Indies. The growth of the American infant tin-smelting industry is shown by the fact that approximately 13 per cent. of the American imports in 1917-18 came to the United States in the form of ores, mainly from Bolivia.—(*Engineering, Oct.* 4, 1918.)

Tunisian Mining Industry.—The value of the mineral production in 1917 was 67 million francs, and the chief items were (in metric tons): Iron ore, 606,000; lead, 41,400; lignite, 32,700; zinc, 15,000; manganese, 5800. The lignite industry is capable of great development; the output for 1918 is estimated at 70,000—75,000 tons.—(*Economiste Français, June* 1, 1918.)

A New Textile Fibre.—A Chemnitz manufacturing company has succeeded in producing a useful substitute for cotton and jute from pine-tree needles. These needles are treated chemically and then prepared by machinery. The finished material can be spun on any cotton-spinning machine. The spun yarn breaks less easily than paper yarn and is also more elastic. This company also manufactures a very serviceable, watertight and pliable substitute for shoe leather.—(*Z. angew. Chem., June* 14, 1918.)

Calcium Carbide Manufacture in Switzerland.—The manufacture of calcium carbide in Switzerland is rapidly becoming an important industry. Whereas in 1901 the production was approximately 4000 tons, the output for 1918 will probably reach 90,000 tons.—(*Eisenwarenhandel, Aug.*, 1918.)

Fluorides as Timber Preservatives. — Seven years' experience in the Austrian Government Telegraph Department has shown that zinc fluoride is a good preservative for telegraph poles. Its use compares very favourably with that of copper sulphate. A partial application of sodium fluoride is found to be effective if complete impregnation of the wood is not desired.—(*Chem.-Zeit., Aug.* 3, 1918.)

Rubber Substitute from German Plants.—The sap of certain *Euphorbiaceæ* growing in Germany has been shown to contain a rubber-like constituent which can be isolated by extracting the dried and powdered plants with ether, carbon tetrachloride, etc., and then adding alcohol to the ethereal extract. Fatty matter is extracted at the same time. Plants of the species *Euphorbia Cyparissias* and *Tithymalus Peplus* are especially mentioned, and it is estimated that if the last named were cultivated on pasture land a yield of 43 kilo. rubber and 120 kilo. fat per hectare could be obtained.—(*Pharm. Zeit., Aug.* 2, 1918.)

The Zinc Industry in Upper Silesia.—Before the war Russia was the principal buyer of Silesian zinc, but now exports are relatively small. The sheet-zinc industry is also much restricted as the rolling mills cannot be run full time. In Upper Silesia there are 13 zinc-blende smelting works, which in normal times employ about 3000 men, but lack of labour due to war conditions has seriously reduced the production, not only of finished metal but also of zinc ore. In peace time the output of blende, calamine, lead ore and pyrites from the twelve mines in operation has an average yearly value of 40 million marks.—(*Z. angew. Chem., July* 26, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

H. R. Merton and Co., Ltd.

In answer to questions put by Lord Sydenham concerning the liquidation of Henry R. Merton and Co., Ltd., Lord Somerleyton said that the liquidation was not directed by the Board of Trade, but the refusal to grant to the company a trading licence under the Non-Ferrous Metal Industry Act had made it impossible for it to continue its business in the non-ferrous metals. The company had resolved upon voluntary winding-up, had appointed Sir Woodburn Kirby as liquidator, and the Board of Trade had ratified the resolution. In the case of voluntary liquidation, shareholders had the right to order the destruction of the books and documents of a company, but the books of the company in question had been inspected by a supervisor appointed by the Board of Trade, and Sir W. Kirby had given the Board his assurance that in this case no such destruction would take place.—(Oct. 16.)

Petroleum Production.

The second reading of the Petroleum (Production) Bill, which passed the House of Commons in August last (this J., 1918, 323 R), was moved by Lord Elphinstone. Its main object is to reserve to the Crown or to its licensees the right of searching or boring for, or getting, petroleum. He objected to the Bill (No. 2) down in the name of the Duke of Northumberland on the ground that it raised controversial points which the Government wished to avoid during the war.

The Duke of Northumberland objected to the Government Bill mainly on the ground that it conferred a monopoly upon a private firm (Messrs. Pearson) which it proposed to assist further with Government funds and Government plant. The Darcy Co., a branch of the Anglo-Persian Oil Co., was ready to bore more than a year ago; its agreement with the owners of some presumably petroliferous land had been nullified, and it was told that it must give way to Messrs. Pearson; the Government had also deliberately delayed the granting of priority for material. The Bill ran counter to the promise made by the Government to the House of Commons that no monopoly would be granted to any one firm. His Bill was designed to speed up production and to exercise impartial control. It provided, *inter alia*, that an advisory committee, appointed by the Director of the Geological Survey, should replace the Minister of Munitions in respect of the defining of petroliferous areas, and that payment for all petroleum obtained by a licensee should be made to those persons who prove themselves legally entitled to it.

Both Bills were read a second time, but a motion to refer them to a Select Committee was negatived. —(Oct. 22.)

HOUSE OF COMMONS.

Exportation of Salt.

Mr. Brunner inquired of the President of the Board of Trade whether the prohibition of the export of salt would involve the stoppage of half the salt trade of the country, the loss of £700,000 in exports, and the dismissal of 2500 employees. Mr. Wardle, in reply, said the exportation had been prohibited because a shortage of coal would entail a reduced output of salt. It was necessary to secure the maintenance of adequate supplies of salt for domestic consumption and to ensure that the Dominions and Colonies should obtain a preferential share of the reduced quantities available for export. There is no intention of stopping the exportation, but only of restricting it to some extent and of regulating its flow. If the shortage of coal continues other trades will probably also be effected.—(Oct. 21.)

Opium Trade in China.

Lord R. Cecil, in reply to Mr. Stewart, said the last six Provinces remaining open to the introduction of Indian opium under the 1911 agreement were examined in August, 1917, and reported free from cultivation. The 1911 agreement terminated on December 31, 1917. H.M. Government has received no official information of any increase in the local production of opium in China since the termination of that agreement and the cessation of the Indian import.—(Oct. 17.)

LEGAL INTELLIGENCE.

Cancellation of Pre-war Enemy Contracts.—In the King's Bench Division on October 14, D. T Boyd and W. A. Pratt applied for declarations cancelling contracts for the supply of American mineral phosphate to six German firms and one Austrian firm. The contracts were made prior to the outbreak of war, and the total amount of phosphate involved was about 50,000 tons. Mr. Justice Bray said that the plaintiffs were entitled to the declarations claimed, that the contracts were dissolved as from August 4, 1914, and that the plaintiffs were discharged from any liability to deliver.

The British Salicylates, Ltd.—Under the compulsory winding-up order made against this company on July 30, the statutory first meetings of creditors and shareholders were held on October 16 at the offices of the Board of Trade, the Official Receiver presiding.

The statement of affairs disclosed total liabilities of £7059, of which £6898 is unsecured and expected to rank against assets estimated to produce £313 15*s*. 8*d*. The company was registered as a private company in 1915, with a nominal capital of £2100 to carry on business as manufacturing chemists and druggists and particularly the manufacture of salicylic acid. It appears that the business had been carried on at a loss throughout. The failure of the company is attributed to want of working capital, the amount subscribed for shares being inadequate to purchase the plant necessary to produce salicylic acid in sufficient quantities to enable the company to dispose of it at competitive prices.

At both meetings it was agreed that the liquidation be left in the hands of the Official Receiver.

Contract for the Sale of Sulphur. *The North British Chemical Co., Ltd., v. Victors, Ltd.*

An appeal by Messrs. Victors, Ltd., from the judgment of Mr. Justice Sankey (this J., 1918, 249 R) was heard on October 17 by Lords Justices Bankes, Warrington and Scrutton. The judgment was upheld and the appeal dismissed with costs.

Vegetable Oil Soap Contract. *M. J. Regan v. Oakley, Sollas and Co., Ltd.*

In the Court of Appeal on October 18, the Company appealed against the decision of Mr. Justice Sankey (this J., 1918, 266 R) in upholding the award given in arbitration in favour of Mr. Regan. After hearing arguments, Lords Justices Bankes, Warrington and Scrutton allowed the appeal with costs, and remitted the case to the arbitrator for him to state with more particularity the facts which he conceived to be evidence in law of ostensible authority and ratification.

TRADE NOTES.

FOREIGN.

Mexico in 1917.—*Acapulco.*—There are as yet no signs of permanent recovery from the unsettled conditions that have prevailed in this State for some time past. Sesame seed, or ajonjali, has been cultivated for some years. In 1912, the coast section produced 2300 tons, but in 1917 only 400 tons was obtained. In former years most of the crop was sent to Spain, France, and Germany, but in 1917 the greater portion went to Mexico City. The crop to be harvested in January and February, 1918, was estimated at 700 to 800 tons. Coconuts and palm nuts grow freely along the coast, as does the Acapulco lime, which is of excellent quality. The export of this product reached a minimum in 1917, on account of the uncertainty of steamer calls. A fair share of the crop was utilised by the citrate of lime factory at La Sabana.

Ciudad Juarez.—The exports of this district to the U.S.A. in 1917 were valued at $4,549,046, and included:—Hides and skins, valued at $150,579; lead, silver and zinc ore, valued at $2,475,305; and silver bullion, $158,219. Political conditions are hindering the full development of silver mining, although several mines may reopen if the present favourable state of affairs continues.—(*U.S. Com. Rep. Supp., July* 5, 1918.)

Tea Oil from Hankow.—"Tea oil" is produced, not from the tea plant, but from the seeds of *Thea sasanqua*, known as "ch'a-yu Kuo-tzu," a relative of the true tea plant, from which it is distinguished by its hairy shoots. Recent exports have been as follow:—1913, 895,400 lb.; 1914, 2,381,000 lb.; 1915, 1,917,500 lb.; 1916, 1,372,800 lb.; 1917, 712,133 lb. The oil is used to adulterate cabbage oil and for the human hair. The refuse cake is valued as a fertiliser.—(*U.S. Com. Rep., July* 11, 1918.)

Proposed Taxation of Manufactured Pig Iron in Germany. — According to the *Swedish Trade Journal*, the German Government proposes to put a tax of 10 marks per ton on manufactured pig iron. On Germany's present production the tax would yield about 200 million marks (£10,000,000) yearly. Foreign purchasers of German iron and steel would necessarily bear this tax, as well as the recently introduced coal tax of 20 per cent. *ad valorem*.—(*U.S. Com. Report, July* 25, 1918.)

German Export Trade in Photographic Materials before the War.—The following statistics are taken from the *Europaische Staats u. Wirtschaftszeitung.* The amounts of materials are given in double hundredweights:—

	Apparatus Lenses		Chemicals		Plates		Sensitised Paper	
	1912	1913	1912	1913	1912	1913	1912	1913
Belgium	121	134	1,037	1,031	—	—	727	905
France	259	365	2,323	4,016	—	—	387	454
Great Britain ...	462	655	1,686	2,491	—	—	2,858	3,145
Italy	202	210	501	704	607	913	487	829
Holland	110	152	1,023	1,639	—	—	616	725
Austria-Hungary ...	412	563	1,817	2,749	3,814	4,247	1,545	2,068
Russia	564	908	2,029	2,115	805	955	1,753	2,112
Sweden	69	77	—	—	805	955	535	658
Switzerland... ...	180	209	2,168	2,461	1,341	1,379	985	1,218
Spain...	75	106	508	687	554	594	—	—
Brazil	75	102	—	—	—	—	—	—
United States ...	69	119	3,927	5,521	—	—	—	—
Japan	—	—	464	537	—	—	—	—
Total exported ...	3,053	4,181	—	27,695	11,676	14,365	—	12,703
Values (mill. mk.)...	7,503	10,623	—	7,949	2,468	3,237	—	5,573

With reference to photographic chemicals, it is pointed out that Germany supplied 95 per cent. of the world's needs. The import of optical glass in 1913 was valued at 1·68 million marks, and the export at 114 millions.—(*Z. angew. Chem., July* 19, 1918.)

Amsterdam in 1917.—The growing scarcity of commodities and raw materials and the great increase in the prices of articles of commerce form the most important feature of commerce and production in the Amsterdam district during 1917. There was a big decline in the imports of cinchona bark from Java, only 24,126 colli (packages) being imported, as against 92,759 in 1916. At the public sales, ten of which were held, 12,803,750 lb. of the bark (equivalent to 782,483 lb. quinine sulphate) were sold, as against 17,365,374 lb. of bark (1,075,127 lb. quinine sulphate) in 1916. This decline is partly due to direct shipments of the material from Java to England and the U.S.A.

The Dutch tin market, of considerable importance in normal times, remained closed throughout the year, as in 1916 and 1915. The imports amounted to 14,040 slabs, the smallest figure on record, comparing with 500,000 slabs in 1913. During 1916, 37 tons of tin was exported, 29 tons of which went to Germany, but no tin was exported in 1917.

The total imports of petroleum amounted to 113,031 barrels, practically all of which came from the U.S.A. The oil imports show a gradual decline from the pre-war figure of nearly 1,000,000 barrels, which was imported from the U.S.A., Russia, Galicia, and Austria. In addition, 38,464 barrels of gas oil was imported as against 71,385 barrels in 1916.

Arrangements were made in 1917 by which machine oil was to be received from Austria-Hungary in exchange for Dutch products. Some of this oil was probably received in 1917, but it does not appear in the official statistics.—(*U.S. Com. Rep. Supp., June* 29, 1918.)

German Interests in Swiss Carbide Companies.—In regard to the assertions made in certain Swiss and French publications that German capital has a preponderating influence in the Swiss carbide industry, the Swiss Electro-technical Society has after thorough investigation found that the allegation is unwarranted. Only two companies are partly financed by German interests—the Elektricitätswerk Lonza, and the Gotthardwerke für Elektro-chemische Industrie in Bodio: in the former of these Swiss capital preponderates and the directorate includes three Germans to six Swiss. The company possesses 75,000 h.p., and will shortly have much more. The German financial interest is practically confined to the branch business in Waldshut, 60—65 per cent. of the products of which are exported to the Central Powers. The Gotthardwerke company is financed by the Swiss company "Motor" in Baden (Switzerland), and the German interest is independent of the A.E.G. Co., of Berlin.—(*Z. angew. Chem., July* 9, 1918.)

GOVERNMENT ORDERS AND NOTICES.

BOILERS (CONTROL) ORDER, 1918.

Under an Order dated October 10, the Minister of Munitions forbids the sale or purchase of any second-hand steam pressure boiler without a permit. Boilers used for locomotives, motor cars, vehicles, and ships are excepted. Applications for permits to be made to the Controller, Department of Engineering, Charing Cross Embankment Buildings, London, W.C. 2.

CLINICAL THERMOMETER ORDER, 1918.

By this Order of the Minister of Munitions, dated October 11, no person shall sell or supply, on or after October 21, 1918, any clinical thermometer which has not been tested, approved and marked in accordance with rules laid down by the Controller of Glassware Supply (22-23 Hertford Street, London, W. 1). The Rules appended to the Order prescribe that the testing and marking shall be performed at the National Physical Laboratory, and that after November 11 no thermometer will be approved which has an error exceeding 0·2° F. over the range up to 106° F. The charge for testing will be *3d.*, with a small additional fee if detailed results of the test are required.

OTHER ORDERS.

The Bones (Maximum Prices) Order and The Bones (Licensing of Purchasers) Order. Ministry of Food, Sept. 23.

The Flax and Yarn (Repeal) Order, 1918. Ministry of Munitions, Oct. 4.

The Ferrous Forgings (Returns) Order, 1918. Ministry of Munitions, Oct. 18.

Iron and Steel Prices.—The Ministry of Munitions announces that the Director of Iron and Steel Contracts (Room 104, M/M., 8 Northumberland Avenue, London, S.W. 1) is modifying, as from October 1, the Schedule of Prices appended to the Order of November 30, 1917. The alterations are given in the *Bd. of Trade J.* of October 17.

PROHIBITED EXPORTS.

By an Order in Council, dated October 15, further alterations were made in the list of prohibited exports, as follows:—

(1) *That the following headings be deleted:*—(C) Agar-agar; (B) antimony and alloys of antimony; (A) bronze powder; (B) citrates; (A) ergot of rye; (C) lithium compounds; (C) lycopodium; (B) mercury, compounds and preparations of (except nitrate of mercury), and mixtures containing such compounds of mercury; (A) mercury nitrate; (A) mercury; (C) oils, essential (except sandalwood and turpentine oils); (B) pigskins; (C) pitch and all mixtures, preparations, and commodities of which pitch forms an ingredient not otherwise specifically prohibited; (C) salt, rock and white (except table salt); (A) siennas; (A) umber.

(2) *That the following headings be added:*—(A) Agar-agar; (A) antimony and alloys of antimony; (A) burettes and their component parts; (A) cassia pods and pulp; (A) chiretta; (A) citrate of iron and ammonium; (B) citrates not otherwise prohibited; (A) culvers root; (A) ergot of rye and the liquid extract of ergot; (A) iron, reduced; (A) jaborandi leaves; (C) lithium compounds, not otherwise specifically prohibited; (A) lobelia; (A) lycopodium; (A) mercury, compounds of mercury, and mixtures and preparations containing mercury or its compounds; (A) tannic acid; (A) valerian rhizome; (A) witch hazel bark and leaves; (A) coal tar pitch; (A) gold leaf; (A) hydrometers made of glass; (A) nitrometers and their component parts; (A) ochres and mixtures containing ochres; (A) oil of cedar-wood; (A) oil of peppermint; (A) oil of sassafras; (C) oils, essential (except cedar-wood, peppermint, sandalwood, sassafras and turpentine oils); (A) pigskins; (C) pitch (other than coal tar pitch) and all mixtures, preparations and commodities of which pitch (other than coal tar pitch) forms an ingredient not otherwise prohibited; (A) salt; (A) siennas and mixtures containing siennas; (A) umbers and mixtures containing umbers.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal, October 10 and 17.)

OPENINGS FOR BRITISH TRADE.

The Department of Overseas Trade will be glad to supply British firms with established connexions in Siberia with any information which can be given from time to time as to the prospects of resuming trade relations with that country, and the conditions of such resumption. Application should be made to the Secretary, Russia Section, Department of Overseas Trade (Development and Intelligence), 7 Whitehall Gardens, S.W. 1.

A firm in Toronto desires agencies for U.K. manufacturers of porcelain ware for engravers, aluminium hexagon rods ($\frac{1}{2}$ in. × $\frac{5}{8}$ in.) and stoneware pottery for etching machines. [Ref. No. 305.]

An agent in Johannesburg wishes to represent British manufacturers of enamelled ware, tin ware, galvanised iron, paper, etc. [Ref. No. 307.]

A firm at Amsterdam desires an agency for U.K. manufacturers of printing ink and bookbinding requisites. [Ref. No. 312.]

A firm at Tetuan, Morocco, wishes to get into touch with U.K. firms able to supply ultramarine, coco oil, palm oil, caustic soda, carbonate of soda, and clear resin. [Ref. No. 320.]

TARIFF. CUSTOMS. EXCISE.

Argentina.—The *Bd. of Trade J.* for October 10 gives a list of the modifications in the Customs Tariff for October.

The export and re-export of edible oil is prohibited, except under licence, as from July 30.

Australia.—The *Bd. of Trade J.* for Oct. 10 gives a list of changes in the Customs Tariff which came into force on Sept. 26 (this J., 1918, 384 R).

British India.—The export of printed matter of all kinds is prohibited, except under licence, as from August 3.

Canada.—The export of silver coin, bullion, and fine bars is prohibited, except under licence, as from August 24.

France.—The export of marble is prohibited, except under licence, as from September 25. The export and re-export of liquorice juice, hops and lupuline is prohibited, except under licence, as from September 12. These articles may still be exported to the U.K., Belgium (uninvaded territory), Italy, or extra-European countries without special authorisation.

Italy.—The *Bd. of Trade J.* for October 10 contains a translation of the Decree No. 1261, of August 29, controlling the import of various articles, including many chemicals and metals, and laying down the administrative machinery for their distribution.

Malay States (Kedah).—A resolution of the Kedah State Council dated May 2 has imposed

export duties on certain articles. Among the articles affected are tin and tin ore, rubber, rice, hides, horns, bones, etc.

New Zealand.—The *Bd. of Trade J.* for October 17 gives the new regulations imposing restrictions on the export of timber.

Spain.—The import duty on sugar has been raised from 25 to 35 pesetas per 100 kilos, as from July 30.

Southern Rhodesia.—The *Bd. of Trade J.* for October 10 gives a list of recent changes in the customs tariff. The list includes blasting explosives, collodion cotton, calcium carbide, certain seeds, spices, turmeric, glycerin, kieselguhr, leather, certain metals, paper, tar, tar oils, etc. Dyes for manufacturing purposes, substances for bating, tanning and finishing of leather, alum, certain oils, oil seeds and nuts, are now admitted free of customs duty.

Sweden.—The export of flint, kieselguhr, fluorspar, cryolite, bauxite, clay of all kinds, sandstone, wood waste, vegetable ivory nuts, nut shells, etc., is prohibited as from October 4.

United States of America.—The *Bd. of Trade J.* for October 10 gives a list of articles which do not come within the scope of the new general import licence known as "P.B.F. 27." United States consuls will not certify invoices for shipments of these goods without being officially notified of the number of the individual import licence concerning the proposed shipment. The list includes asbestos, asphalt, aloxite, borax, caffeine, casein, castor oil beans and castor oil, cement, chloride of lime, certain metals their ores and derivatives, leather, kapok, mahogany, malt liquors, mica, nitrate and cyanide of soda, animal and vegetable oils, oilcloth and linoleum, optical glass, paraffin, rubber, starch, tanning materials, etc.

The *Bd. of Trade J.* for October 17 gives further recent rulings of the War Trade Board respecting import restrictions. Among the articles affected are corundum, varnish gums, dyewoods, etc.

REPORTS.

REPORT ON THE TRADE OF SOUTH AFRICA FOR 1917. By W. G. Wickham, H.M. Trade Commissioner in South Africa. [Cd. 9155, 3*d*.] London: H.M. Stationery Office.

The year 1917 was a notable one from the point of view of industrial development, which for the first time was placed on a national basis. A census of industrial production was instituted; a Federation of Industries was formed and affiliated to the British Empire Producers' Organisation; the Industrial Development Company was floated in order to provide financial assistance for new industrial enterprises; the Industries Section of the Department of Mines and Industries with its advisory councils was thoroughly organised; "The South African Journal of Industries" was published for the first time; and new companies were floated to establish vital primary industries, notably the production of iron.

Chemical industries are well represented in the list of new enterprises, for these include the manufacture of carborundum, calcium carbide, alcohol motor fuel (in addition to methylated spirit and industrial alcohol from sugar cane refuse), asbestos goods, paint and distemper from local materials, maize starch, stearin, sulphate of ammonia, shoe and floor polishes, wattle bark, etc.; the refining of arsenic and antimony, tin smelting and recovery from scrap, and lead corroding for white and red lead. It is also proposed to manufacture acetone, paper, tartaric acid, and condensed milk, and the production of oxygen is being extended. In addition, salt is being refined from local saltpans, and carbonate of soda deposits, chrome ore, magnesite, mica, and pyrites are all being worked energetically. The most important of the new industries is undoubtedly the iron industry, but in this connexion the shortage of good coking coal is noted. Mining has been comparatively normal.

With respect to fertilisers, agriculture has been heavily handicapped by the scarcity of phosphate; basic slag has been practically unprocurable and the importation of superphosphate from Japan was cut off during the year. The absence of Indian bone-meal has been balanced by an increased supply of local abattoir refuse. Sulphate of ammonia, now being manufactured in Natal, has been shipped to the sugar growers in Mauritius as it apparently does not suit African soils (this J., 1918, 96 R, 113 R). The question of a home production of phosphatic manures is receiving serious attention; in the event of recent discoveries of rock phosphate proving adequately rich, an expansion of the sulphuric acid industry is bound to follow.

The following table shows the distribution of the import trade in the years 1913, 1916, and 1917:—

Year	Total Imports	U.K.	India	Australia	Canada	Total British Empire	Germany	U.S.A.	Japan
	£	%	%	%	%	%	%	%	%
1913	38,526,581	54·43	2·82	5·21	2·22	66·36	8·83	9·52	0·28
1916	38,759,262	58·68	3·75	3·35	2·23	69·37	—	15·67	1·40
1917	34,750,782	52·46	6·13	3·64	2·75	66·55	—	17·92	2·10

Thus the United States has attained the dominant position among the rivals of Great Britain. Of the manufactured goods in which American gains are to be noted, the most important group is "Iron and Steel," which shows an increase of £250,000 since the outbreak of the war, while the imports of baking powder, an American monopoly, increased by £37,000 during 1917. Amongst other goods in which the U.S.A. has entered this market for the first time may be mentioned:—Acids, caustic soda, disinfectants and dips, drugs, dyes and tanning preparations, superphosphates, malt, glucose, sugar, cream of tartar, starch and other oilman's stores, printing ink, waterpaints and distempers, perfumery, soaps and unmanufactured zinc.

The growth in the trade of India and Japan is also to be noted. As progress is made in refining oils, India will probably monopolise the supply of linseed, castor, rapeseed and possibly cottonseed oil. Coir fibre, petroleum and Indian pig iron are also being imported. Japan shows increases in leather manufactures, superphosphates, perfumery, and sulphur. The Dutch East Indies and the British West Indies are responsible for the large increase in the imports of mineral oil; and China has a large share of the trade in cottonseed oil.

The exports during 1917 included:—Copper (ore and regulus), £976,422; other minerals, £402,178; wool and hair, £9,062,916; hides and skins, £2,637,735; maize and other cereals, £2,229,309; blasting compounds, £525,666; wattle bark and extract, £273,502; and asbestos, £87,000.

A census of industries was taken for the first time during 1917. The published data are somewhat meagre but the following list shows the production of some industries of chemical interest. The figures in parentheses give the value of imports of goods covered by the industry in question in 1916:—Explosives and matches, £1,884,149

(explosives £1599, matches £1855); soap and candles, £1,735,389 (£97,012); leather, £475,862 (£120,203); cement, £270,129 (£46,743).

REPORT ON THE TRADE OF CANADA AND NEWFOUNDLAND FOR 1917. By the Officer-in-Charge of H.M. Trade Commissioner's Office at Montreal. [Cd. 9159, 3*d*.] London: H.M. Stationery Office.

The most important event bearing on the economic position of Canada in 1917 was the entrance of the United States into the war. Prior to this, it seemed as though Great Britain would be compelled to withdraw from the export trade to Canada in favour of the States, but the entry of the latter changed the situation. Canada is now receiving immense orders from both countries, but has to rely mainly on the States for the necessary raw materials.

The Census of Manufactures for the year 1915 is now complete. Included in it are the following statistics relating to the chemical and allied industries:—

—	Number of Establishments	Capital	Cost of Materials	Value of Products	Value of War Trade
		Millions of Dollars			
Chemicals and allied products	255	52·2	24·9	45·4	8·5
Iron & steel products	851	195·9	59·2	120·4	31·5
Metals and metal products other than steel	1,173	174·6	45·9	90·9	9·8
Clay, glass, and stone products	772	96·4	11·0	27·2	0·082
Textiles	2,671	126·5	81·4	144·7	23·3
Paper and printing ..	1,306	138·6	29·3	74·0	0·064
Liquors & beverages	341	52·3	10·1	34·9	0·019

Importers in New Brunswick have reduced their demands for British goods in accordance with the limited supplies available, and are handling lines of U.S. manufacture in much larger volume. Goods formerly manufactured in Germany and Austria are now being imported from Japan, and Japanese manufacturers have agents all over the district, studying the requirements of the local markets.

In Quebec the trade in pulp and pulp wood continues to increase at a very rapid rate, last season being a very profitable one. Quebec produces much the greater part of the world's supply of asbestos, the total output for 1917 being valued at \$6,250,000. Paper is also an important product.

From the outbreak of war until the end of 1917, Ontario had received munition orders to the value of \$1,000,000,000. All labour has naturally been completely engaged at good rates. The factories of Ontario are probably responsible for 50 per cent. of the total Canadian output of manufactured goods.

The mining industry was very active during 1917. The important Cobalt camp of Ontario is the principal contributor to Canada's output of silver. From 1904, the first year of the camp, to the end of 1916, 255,189,988 ounces of silver was mined. Originally only the richer ore was shipped, but a number of Canadian enterprises have been started to produce not only refined silver but refined arsenic, cobalt and nickel. The low grade ore is concentrated, the number of mills operating being fifteen, while the tonnage handled shows a rise from 50,000 tons in 1907 to 635,000 tons in 1916. Oil flotation has been introduced successfully, and will make available deposits of tailings estimated at 2½ million tons.

A good deal of investigation into the oil wells of Alberta has taken place, but there have been no great developments, the production of oil and natural gas being the same as for last year. The output of coal will be larger.

The mineral production of British Columbia for 1917 is valued at \$36,161,528, a decrease of over 10 per cent. compared with the previous year.

The Newfoundland seal fishery had a profitable year, twelve steamers catching 196,228 seals, weighing 3285 tons. The paper and pulp mills shipped nearly all their product to the United States. The output of iron from the Bell Island mines and of copper from the copper mines in Notre Dame Bay has been equal to that of the previous year. The total mineral products exported were valued at \$1,256,242.

Some valuable suggestions for U.K. manufacturers and exporters to Canada are given in the report.

REVIEWS.

ORGANIC COMPOUNDS OF ARSENIC AND ANTIMONY. *By* GILBERT T. MORGAN. *Monographs on Industrial Chemistry, edited by* SIR EDWARD THORPE. *Pp. xx + 376. (London: Longmans, Green and Co.) Price* 16*s. net.*

In view of the importance of aromatic arsenic compounds in medicine, and the introduction, since the war, of the manufacture of salvarsan and its derivatives into English-speaking countries, the appearance of an English monograph on the subject is welcome. Professor Morgan's book is an excellent and complete compilation of the chemistry of these compounds, but it is difficult to understand why it is published as a monograph on *industrial* chemistry; of the hundreds of compounds mentioned, only a dozen or so are of practical importance, and the treatment of these is academic.

The book is more up to date than Bertheim's well known "Handbuch der organischen Arsenverbindungen" (1913) and differs from it in arrangement. Fifty-three pages are devoted to cacodyl and the aliphatic arsenic and antimony compounds; then follow 61 pp. on the aromatic arsenicals prepared by Michaelis' methods, 63 pp. on atoxyl and other products of the Béchamp reaction, 42 pp. on salvarsan and its analogues, 13 pp. on neosalvarsan, galyl, and other derivatives, 10 pp. on aromatic primary arsines, 16 pp. on luargol and other co-ordination compounds, 36 pp. on aromatic antimonials, and 17 pp. on miscellaneous compounds. An appendix (7 pp.) deals with the estimation of arsenic in organic compounds, and the book is provided with a chronological bibliography and indexes. Numerous references to patent and other literature are given in footnotes throughout the book. Each chapter consists of a readable introductory portion, followed by a full description of the methods of preparation and the properties of the individual compounds.

The separation of aromatic arsenicals into two sections, dealing with those prepared by Michaelis' and Béchamp's methods respectively, has led to an arbitrary division of the arylarsinic acids in Chapters III. and IV., and to a generalisation of their methods of preparation in Chapter III. (p. 74) which does not include the important method described in Chapter IV.

The facts concerning the history of the introduction of atoxyl into medicine are not clearly given (pp. xvi, 65, 154). Atoxyl was introduced into medicine by the Vereinigte Chemische Werke Akt.-Ges. as meta-arsenic anilide, $C_6H_5.NH.AsO_2$, containing 37·7% As, and Fourneau was the first to show that it was in fact a sodium salt, identical with Béchamp's salt and containing only 27·3% As. It might be added that salvarsan itself when first introduced into medicine was alleged to be the anhydrous salt containing 34% As, until Gaebel showed that it

was hydrated and contained about 31·6% As. Reference to this author's papers should be inserted in later editions of the book.

The statement that the free base of salvarsan is soluble in aqueous sodium carbonate (p. 224) is better expressed in the qualified form on p. 227, whilst the solution of salvarsan in caustic soda employed for intravenous injection cannot properly be termed "approximately neutral" (p. 251). The arsenic content of neosalvarsan is about two-thirds of that of salvarsan, *i.e.* about 21%, not 24% as stated on p. 253. The test on the live animal (p. 253) is employed to limit the toxicity of the preparation, not to determine its efficacy. The brief account of the application of drugs containing tervalent arsenic (p. 287) notes the advantages of neosalvarsan over salvarsan, but does not indicate that there are many who believe the latter remedy to be more efficacious. The abstract of a French report which forms more than half of this article might well have been condensed.

There are rather more mistakes and typographical errors in the book than one would expect to find, but doubtless these will be corrected in later editions.

F. L. Pyman.

The Recovery and Re-Manufacture of Waste Paper. *By* James Strachan. *Pp.* 158. (*Aberdeen: The Albany Press, Bridge Street,* 1918.) *Price* 12*s.* 6*d. net.*

This is a practical treatise on the re-working of old or waste papers, a matter of increasing moment as we progress towards industrial famine. The experienced mill-manager would perhaps doubt that there could be any profitable specialisation in a side issue of the primary manufacture, and would consider that the re-working of the mill "broke" involves all the essential points to be dealt with in a text book treatment of the subject. We can, however, commend the book to the attention of the most experienced, even if not actually engaged in handling the miscellaneous salvage of "waste" papers—since it is a useful critical commentary on mill methods generally. Moreover, in the specialised treatment of the subject matter there is a general critical survey of papers (and boards) in relation to their multifarious uses, which is interesting reading for the paper maker, the stationer, and even the man in the street.

In relation to chemical industry, the subject matter is of obviously minor importance. The treatments for the removal of ink-constituents, printing, typewriting and ordinary iron-gallic inks, are necessarily based on the chemistry of these and involve the well-known reactions.

We might suggest as a "rider" on the problems dealt with, an interesting examination test for students of paper technology, that they be given sheets of written or printed matter to be returned to the examiner in as nearly as possible their original state, with the rationale of all the treatments involved in restoring them to that condition. Moreover, should the worse come to the worst and the shortage of writing papers reach famine conditions, there might be an opening for a more serious extension of the de-inking of paper in sheets to be re-finished as such, for use. The author might add a supplementary note on this in later editions, for which, on the merits of the book, there will certainly be a call.

The book is produced on a re-worked paper as the best possible illustration of the subject matter. The author also gives the data of composition and the full series of tests of quality. This gives the finishing touch to a seasonable and also permanently valuable contribution to paper technology.

C. F. Cross.

Chemical Combination among Metals. *By* Michele Giua *and* Clara Giua-Lollini. *Translated by* G. W. Robinson. *Pp.* 341. (*London: J. and A. Churchill,* 1918.) *Price* 21*s. net.*

The compounds which the metals form with one another constitute an exceedingly interesting class, the chemistry of which presents some unusual features. In particular, the fact that the formulæ of intermetallic compounds are only in rare instances reconcileable with the ordinary rules of valency is of great theoretical importance, for the stability of many of these compounds makes it impossible to regard them as mere loose atomic complexes. The more closely the two components approximate to one another in the electro-chemical series (or the more "homopolar" the compound) the less likely is their combination to take place in accordance with the generally accepted valencies of the metals. Whilst this fact has an obvious bearing on the theory of valency, no satisfactory solution of the difficulty has yet been reached.

An accurate knowledge of the composition and stability of the intermetallic compounds being essential to any discussion of their nature, the authors of the present work have sought to collect and present the available data, or at least those resulting from thermal analysis. Unfortunately, whilst they have shown great industry in their task and have brought into convenient form a large mass of information, they have been somewhat uncritical in their acceptance of published work, and have reproduced much that is of very doubtful value. The book is based chiefly on the investigations of Tammann and his students, and attention is not drawn to the fact, well known to most metallurgists, that most of these thermal analyses were performed with quite insufficient quantities of impure materials, and with comparatively rough pyrometric methods.

It is true that such researches as those of Kurnakoff in Russia and of Parravano in Italy, although following the same lines as those of Tammann, were much more accurately performed, but these represent only a very small proportion of the systems discussed. English work has been almost entirely neglected, although it includes some investigations of an altogether higher order of accuracy, and there does not appear to be a single reference to the Journal of the Institute of Metals. However, the provisional equilibrium diagrams are brought together more conveniently, although less critically, than in the bulky work of Guertler.

The section dealing with "heteropolar" intermetallic compounds includes the arsenides, silicides, phosphides, etc., and even the sulphides, whilst the metallic antimonides are classed as "homopolar." Such a distinction is rather artificial, as the two classes shade into one another, and there is a continuous transition from the most homopolar compounds to the sulphides, which are not usually regarded as intermetallic compounds.

The most novel section of the book deals with the compounds which Kurnakoff has regarded as of variable atomic composition, and the Russian author's views are interestingly stated, but the facts are possibly capable of another interpretation, and we are hardly justified in reverting to the standpoint of Berthollet in his controversy with Proust on such slender experimental evidence.

The influence of intermetallic compounds on the physical properties of the alloys in which they occur is briefly treated, although with very few concrete examples, and there is an introductory section explaining the general principles of the diagram of thermal equilibrium. The text and diagrams are clearly printed.

Cecil H. Desch.

Les Fours Electriques de Laboratoire. *By* Jean Escard. *Pp.* 72, *and* 60 *illustrations.* (*Paris: H. Dunod et E. Pinat,* 1918.) *Price* 5 *fr.* 40 *c.*

In this book M. Escard gives a short account of the various kinds of electric furnaces used in laboratories at the present time, and indicates their uses and limitations. The book is divided into seven chapters, the first of which is devoted to a description of the materials used in the construction of the furnaces, such as refractories and resistance materials; whilst the remaining six chapters consist of descriptions of different types of furnace. The illustrations are good throughout, and the book as a whole may be considered as a concise summary of electric furnace practice in French laboratories at the present time.

From the small amount of notice given to nickel-chrome resistance furnaces, it may be concluded that the rapid development of this type witnessed in this country during the last four years has not extended to France. Experience here has shown that nickel-chrome is greatly superior to platinum as a winding for producing temperatures up to 1000° C., and the varieties of platinum-wound furnaces described by the author are little used in Britain. A number of small arc-furnaces, suitable for heating tubes and crucibles, are described, and the chapter devoted to these contains much useful information on the application of arc-furnaces to different kinds of investigation. Other forms dealt with are those in which the arc is struck above the material undergoing treatment; and also furnaces in which the current is passed through various materials such as granular carbon, kryptol, etc., for the external heating of tubes and crucibles. Special attention is given to furnaces for testing refractories, and a description of the type devised for this purpose by Dr. Griffiths, of the National Physical Laboratory, is included. An account is also given of electrically-heated salt baths, as used in the heat treatment of steel; and a brief chapter on induction furnaces closes the book.

The volume may be regarded as a timely contribution to a subject of growing importance; and the author is fully alive to the part which high temperature processes are destined to play in the future of industry. Following a description of a large experimental furnace installed at the University of Grenoble, he expresses the opinion that the future of the chemical and metallurgical industries of France depends upon the establishment of numerous research centres, at which electric furnace experiments may be carried out on a scale large enough to indicate commercial possibilities. It might truthfully have been added that the same remarks applied to Britain, which in this respect is even worse off than France.

Chas. R. Darling.

PUBLICATIONS RECEIVED.

A Memoir on British Resources of Refractory Sands for Furnace and Foundry Purposes. Part I. *By* P. G. H. Boswell. *With Chemical Analyses by* H. F. Harwood *and* A. A. Eldridge. *Pp.* 246. (*London: Taylor and Francis,* 1918.) *Price* 8*s.* 6*d.*

Memorandum on Cutting Lubricants and Cooling Liquids, and on Skin Diseases Produced by Lubricants. Department of Scientific and Industrial Research. *Bulletin No.* 2. (*London: H.M. Stationery Office.* 1918.)

Census of Dyes and Coal-Tar Chemicals, 1917. *Publications of the United States Tariff Commission. Tariff Information Series, No.* 6. *Pp.* 73. (*Washington: Government Printing Office.* 1918.)

Recovery of Gasoline from Natural Gas by Compression and Refrigeration. *By* W. P. Dykema. Bureau of Mines, U.S.A. *Bulletin* 151. *Petroleum Technology* 40. *Price* 25 *cents.* (*Washington: Government Printing Office.*)

PERSONALIA.

Sir Herbert Jackson has resigned the Daniell Professorship of Chemistry at King's College, London, in order to take up a Government appointment.

A Baronetcy of the United Kingdom has been conferred upon Mr. E. Tootal Broadhurst, of Manchester.

Sir W. H. Thompson, scientific adviser to the Ministry of Food, was among the victims of the sinking of the Irish mailboat *Leinster* by a German submarine on October 10 last.

Mr. Sandbach Parker has resigned the chairmanship of the British Empire Producers' Organisation, and will be succeeded by Sir Duncan Baillie.

Prof. W. A. Bone, with the concurrence of the authorities of the Imperial College of Science and Technology, has asked to be relieved of his duties as consultant to the Fuel Research Board as from October 22 last, in order to be free to devote his attention to plans now under consideration for the post-war development of the Department of Chemical Technology at the College.

According to the *Canadian Chemical Journal,* Prof. W. O. Walker, of the department of chemistry, Queen's University, has been appointed professor of chemistry at McMaster University, Toronto, in succession to the late Dr. J. Bishop Tingle. Prof. S. F. Kirkpatrick, also of Queen's University, has accepted a position with the Deloro Smelting and Refining Co., of Deloro, Ontario.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Induchem, Finsquare, London.*]

L'ENTENTE CHIMIQUE.

Those who attended the luncheon given by the Council of the Society and the Committee of the London Section in honour of M. Paul Kestner, the distinguished president of the Société de Chimie Industrielle, cannot have failed to be impressed by the importance of the gathering, or by the happy inspiration which prompted the London Committee to call it together. The occasion will long be remembered as one of the most remarkable in the annals of the Society.

Since we first drew attention to and welcomed the formation of the French Society (this J., 1918, 2 R, 5 R), its rise and progress have been in every way noteworthy, and the time must now be ripe for considering ways and means of effecting that full measure of co-operation between the two societies which is so clearly desirable. Although much can be done through the medium of the written or printed word, mutual understanding, the condition precedent of mutual help, is best promoted by personal intercourse; and this applies equally to the general international reconstruction, referred to by Prof. Louis in his speech, for the time has gone by when the promotion of mutual knowledge and good will among nations can be left with safety to the daily press and to imaginative littérateurs. Prof. Louis' well-chosen and incisive remarks on the four pivots of the chemical and allied industries —raw materials, fuel, labour, and technical administration—will find general acceptance among technologists, as will also the opinion he expressed at the evening meeting, that technical men should be consulted by officialdom on all matters involving scientific knowledge and method (and what matters do not?). It therefore devolves upon every scientific worker to see that science no longer remains unvocal in our public life.

M. Kestner's allusions to the time when he lived among us and attended our meetings, and to the notable part played by Allied technologists in the development of the heavy chemical industry, were conceived in the happiest vein, and his denunciation of Teutonic methods of warfare also naturally met with a full meed of approval. The sympathy of all chemists will go out to him and his fellow-countrymen for the irreparable losses in blood and treasure they have sustained. Like all true Frenchmen, M. Kestner is a patriot to the core, and the general tenor of his speech recalled the saying of his great compatriot, Louis Pasteur, at the time of the Franco-Prussian war, "La science n'a pas de patrie, mais les savants en ont une."

It was perhaps human and natural that some self-satisfaction should have been expressed at the great part which chemistry has played in the defensive war waged by the Allies; but the testimony of Lord Moulton will allay criticism on this head. As Director-General of Explosives Supply since the outbreak of war, Lord Moulton has every qualification to judge, and his statement that the chemical industry has "never kept a shell waiting" was a seasonable acknowledgment of merit where merit is due. Members of the Society of Chemical Industry will also read with pleasure of the tributes accorded to the successful work done by the Society in the past, and they will cordially agree with Dr. Carpenter that this success should be regarded as the starting point for the many tasks which loom in the future.

The occasion of the reading of M. Kestner's paper on the Alsatian potash deposits was equally notable, and a very large audience attended at the rooms of the Royal Society of Arts to welcome the president of the sister society and to hear his important and comprehensive address. Its main theme was that Alsace-Lorraine is the key to the industrial and economic supremacy of Germany. From Lorraine she obtained three-fourths of her supplies of iron ore, and owing to her possession of Stassfurt and Alsace she was able to exercise a world monopoly of potash. That monopoly would be terminated if the Alsatian deposits were transferred into French hands, for then the Allied countries would jointly possess enough of the mineral to render them independent of the German supply. These deposits are estimated to contain nearly 1500 million metric tons of mineral (mostly pure sylvinite), equivalent to more than 300 million tons of potash (K_2O) and sufficient to supply the United States, France and England for over 1000 years, on the basis of their consumption in 1913, or France and England for well over 5000 years. The average potash content of the Alsatian mineral is about 50 per cent. higher than that of the Stassfurt salts, the deposits are much more easily worked, and the material is mostly so pure that refining is unnecessary. The world's output before the war was about one million tons of potash (K_2O) per annum, nearly all of which came from Stassfurt, and of which about one-half was consumed in Germany. The very high fertility of German soils, compared with the French, is ascribed by M. Kestner to the much heavier dressings of potash which they have received, and these dressings have notably increased during the war, the amount used in 1917, 800,000 tons (K_2O), being about double that consumed in 1913. In the discussion, Mr. L. Weaver, of the Food Production Department, pointed out that the poor sandy soils of Germany are much more responsive to this fertiliser than are the heavier soils of many other countries, and both he and Prof. Louis laid emphasis on the part played by phosphatic fertilisers, mainly derived from the iron ores of Lorraine, in promoting the fertility of German soil. In the course of his remarks, Mr. Weaver stated that the English consumption of potash for the land was 15,000 tons (K_2O) before the war, and that for the year 1918-19 not more than 2000 tons would be available from flue dust recovery processes. In view of the consideration that the demand for potash for agricultural purposes is likely far to exceed the pre-war consumption, especially in the immediate future, these facts lend additional weight to M. Kestner's statement that the chemical industries alone will consume an amount equivalent to the output from "recovery" and subsidiary sources, and that the enormously greater demands of agriculture can only be met by the exploitation of mineral deposits.

THE AMERICAN DYE INDUSTRY.

The "Census of Dyes and Coal Tar Chemicals, 1917,"* undertaken by the United States Tariff Commission, is an important outcome of the Revenue Act of September, 1916, which provided, *inter alia*, that the prescribed rates of duty on dyes and other coal-tar products shall continue only so long as the home production does not fall short of 60 per cent. of the domestic consumption. The census supplies the facts necessary for the enforcement of this provision.

The book is divided into three parts dealing with the census of dyes, the history of the dye industry during the war, an appendix containing statistics of imports and exports and a list of manufacturers of coal-tar products.

* Tariff Information Series, No. 6. Washington: Government Printing Office.

The coal-tar products are divided into crude, intermediate and finished products.

Among the crude products, benzene and toluene are noteworthy on account of the enormous increase in their production, caused by the demand for high explosives during the war. In 1914 the output of benzene was four and a half million gallons, but in 1917 it had risen to forty million gallons, an increase of nine hundred per cent. In contrast to this it may be mentioned that anthracene has not been manufactured in the United States during the war, although an output is expected for 1918.

The most important of the intermediates is synthetic phenol, which was not manufactured before the war. In 1917, the output of more than 64,000,000 lb. was employed almost entirely for military purposes, but, as the report points out, with the conclusion of peace the greater part of this material will be available for the production of dyes, drugs, etc.

An interesting tabulation of the coke production from 1890 to 1917, and also of the by-products obtained in its manufacture, is followed by a short account of each of the commoner coal-tar hydrocarbons, together with their principal uses. The United States produced no anthracene before the war and imported none. Hence she was wholly dependent on outside supplies for her alizarin and other vat dyes, which include some of the fastest and most important cotton dyes known. The same was true of carbazol and the derived vat dye hydron blue. In pre-war days there was a much smaller import tariff on intermediates than on finished dyes, and this caused the German firms, in many cases, to manufacture the intermediates up to the last stage of dye production, shipping these final intermediates to the States, there to be assembled and converted into finished dyes. In this way the German firms escaped the extra tax on completed colouring matters. The result of this was that over one-half of the dyes manufactured outside Germany were made from German intermediates, and as three-fourths of the world's production of dyes came from inside Germany, the overwhelming nature of that country's monopoly can be easily realised.

A long list is given of intermediates, together with the identification numbers of their manufacturers, the total production and value for 1917 and the average price per pound. It is pointed out, however, that the figures are bound to be somewhat incomplete.

A point which is emphasised, and which it is well to remember applies with equal force to Great Britain, is that mentioned above in connexion with synthetic phenol; namely, that after the war large quantities of phenol, aniline, picric acid, chlordinitro-benzene, etc., will come on the market at low prices, owing to the large numbers of plants which have been put up in order to supply the needs of the shell-filling factories for high explosives. It is expected that these low-priced raw materials will rapidly create new demands for themselves in such branches of commerce as the synthetic resin and the synthetic tannin industries and other branches of chemical trade. Attention is drawn to the close relationship between dyes and explosives, the illustration given being that between sulphur black and picric acid. These two substances are manufactured by almost identical methods, the penultimate stage being dinitrophenol. This intermediate can be converted either into picric acid by further nitration, or into sulphur black by treatment with sodium sulphide and sulphur. Thus a factory turning out sulphur black could be rapidly changed into one producing picric acid. Hence it follows that a well developed dye industry is a very great asset to a country contemplating war, a fact evidently well known to Germany.

A four-page list is given of finished dyes, the identification numbers of the respective manufacturers, and the total production in 1917. Then follows a short account of the personnel of the coal-tar industry and of their rates of pay. Of the total employees (19,643), 8·8 per cent. were chemists or engineers, and of these 50 per cent. were getting $30 or over per week. There were 104 research laboratories in the United States connected with the various manufacturing firms, with operating expenses amounting to $2,486,807.

The second part of the book, comprising the history of the dye industry during the war, is divided up into four periods. During the first, from the declaration of war in Europe until March 19, 1915, the dye shortage in America was not acute, since shipments were obtained from Germany in exchange for cotton in about the usual amounts. After March 19, 1915, the import of dyes from Germany ceased owing to England declaring cotton to be absolute contraband, whereupon Germany refused to export dyes except in exchange for cotton. This caused a return to the natural dyes, such as logwood, fustic, etc., of which large quantities were used. The imports of cochineal during 1916 were six times as great as in 1914. During this period the dye shortage was relieved to a small extent by the dyes brought to the States by the submarine "Deutschland" in July and October 1916. The period from September 8, 1916, to April 6, 1917, was characterised by a steady increase in the home production of dyes, chiefly, however, of the more easily made varieties. The shortage was so great that in some cases wool dyes were used on cotton, with disastrous effects on the reputations of vendors and dyers. With the declaration of war by America came a great demand for khaki dyes, which could not be completely supplied owing to the commandeering of such essentials as toluene, chlorine, etc., by the military authorities.

The book concludes with a sixteen page appendix, statistics of various coal tar products, and a directory of dye manufacturers, giving their identification numbers. This official treatise contains many useful lessons for the English dye producers, and is worthy of their careful consideration.

THE DANGERS OF EXPLOSION WITH INFLAMMABLE LIQUIDS AND VAPOURS.

W. PAYMAN.

The danger of explosions due to the ignition of mixtures of inflammable vapours and air is present in many common industrial operations. It is important that the extent of this danger should be realised so that necessary precautions may be taken when handling or using liquids, such, for example, as benzol and gasoline, which yield inflammable vapours. The exact determination of the factors which decide the liability of a given liquid to give explosive mixtures presents a number of experimental difficulties, and, perhaps for this reason, has not attracted many investigators; but some information of value to technical chemists may be found scattered in chemical literature.

The nature of the danger to be apprehended during the use of inflammable liquids will depend upon the process or processes being employed. These may be divided roughly into three classes:—

(1) Processes in which the liquids are used for crystallisation, precipitation, or as solvent media, or where they are being chemically treated as in sulphonation and nitration.

(2) Processes carried out in drying stoves or

rooms, heated externally or by hot air blast, in order to remove the liquids from finished chemical products, with or without the subsequent recovery of the vapours by condensation or washing.

(3) Storage of liquids in tanks, and their transfer therefrom to plant or containers.

Throughout all such operations the danger arising from accidental leakage must also be taken into account.

The two most important criteria for judging the liability of a given liquid to produce dangerous conditions are:—

(1) The volatility of the liquid.

(2) The range of explosion of the vapour when mixed with air.

Martini and Hüneke (Chem.-Zeit., 1916, 40, 948; J.S.C.I., 1916, 35, 1212) have discussed these points with special reference to benzol and benzine, and a mathematical treatment of their paper has been added by Kubierschky (Chem.-Zeit., 1917, 41, 685).

Each inflammable vapour has a definite range of explosibility when mixed with air. Mixtures containing less than a certain percentage of vapour, known as the lower limit of inflammability, will not allow the continued propagation of flame, though a source of heat of sufficient intensity may cause a local ignition. If the percentage of vapour be increased, a point, called the upper limit of inflammability, is at last reached when the mixture is again incapable of propagating flame, and no mixture containing a greater percentage of vapour than this upper limit mixture will give more than a local inflammation.

The limits observed experimentally differ slightly with different positions of the point of ignition, as the flame may be helped or retarded by convection currents according to whether it has to pass upwards or downwards. For a detailed consideration of the experimental determination of the limits of inflammability of gas mixtures reference should be made to the work of Coward and Brinsley (Trans. Chem. Soc., 1914, 105, 1859; J.S.C.I., 1914, 33, 851), and Burgess and Wheeler (Trans. Chem. Soc., 1914, 105, 2591; J.S.C.I., 1914, 33, 1194).

It will be understood that, other things being equal, a vapour which gives with air mixtures having wide limits of inflammability will be more dangerous than one having narrow limits. For example, acetone, with a range of 6·15 per cent. (*i.e.*, between 2·35 per cent. lower and 8·50 per cent. upper limit of inflammability), is more dangerous than benzol, with a range of only 3·3 per cent. (1·4 to 4·7 per cent.). The appended table gives the limits of inflammability of the commoner organic solvents as recorded by different observers.

The vapour pressure of the liquid may be so small at the temperature at which it is used as to be incapable of forming a lower limit mixture with the surrounding air. On the other hand a highly volatile liquid may easily give mixtures which are above the upper limit of inflammability. In the latter event it is important to note that the full range of inflammable mixtures has to be passed through before the percentage of vapour in the air renders the mixture safe; and, when this "safe" mixture has been attained, if the chamber be opened at any time to the outer atmosphere an explosive mixture would soon be formed by the inward diffusion of additional air.

From a knowledge of the vapour pressures of an inflammable liquid at different temperatures, coupled with a knowledge of its "limits," we can predict the working temperature at which the vapour pressure is (1) just sufficient to give a lower limit mixture, and (2) just sufficient to give a higher limit mixture. What may be termed the lower limit temperature of a volatile liquid corresponds in a sense to the "flash point" of an oil, though the latter, as determined by the recognised methods, has no absolute meaning, the results being only relative. It must be remembered, however, that still air does not become saturated with a vapour for a considerable time, and so both the calculated limit temperatures may be lower than those actually required in practice to obtain the limiting compositions. Again, an increase in temperature widens the limits of inflammability, but from analogy with experiments with methane-air mixtures (Mason and Wheeler, Trans. Chem. Soc., 1918, 113, 45; J.S.C.I., 1918, 37, 115 A) it is unlikely that this effect will be appreciable over the range of normal working temperatures.

Two other factors are of importance when considering the inflammability of vapours:

(3) The speed of propagation of the flame in the mixtures with air.

(4) The ease of ignition of the mixtures.

The speed of propagation of flame is important whenever explosive mixtures are liable to be produced in long mains, as, for example, with acetone-air mixtures during the stoving of cordite (Wheeler and Whitaker, Trans. Chem. Soc., 1917, 111, 267; J.S.C.I., 1917, 36, 587). It should be noted that the speed of the flame in mixtures of a given vapour with air varies with the vapour content, being at a maximum when the percentage of vapour lies about midway between the limits, and falling rapidly as the limiting compositions are reached.

When considering the prevention of explosions, careful attention must be paid to the possibility of ignition of vapour-air mixtures by mechanical means, due to faulty or normal working of machinery in contact with the vapours. Sparks caused by grinding of ill-fitting parts, or the overheating of bearings due perhaps to similar causes, may be mentioned as possible sources of ignition. Unfortunately very little information is available on this point. Its importance has long been realised by mining engineers, but they have only examined the special tools and machinery used in coal mining to see whether sparks caused in operation would be powerful enough to ignite mixtures of firedamp and air. (Compare, for example, Meyer, Oesterr. Z. f. Berg- u. Hüttenwesen, 1886, 34, 379.)

The prevention of explosions during storage and transference of inflammable liquids has perhaps received most attention. It will be readily understood that the use of compressed air for moving inflammable liquids from vessel to vessel is attended with great danger. In its place compressed flue gas, nitrogen, carbon dioxide or other "inert" gas may be used with advantage, as the risk of explosion is no longer present if there be insufficient oxygen in the atmosphere in contact with the liquid. In this connexion reference may be made to some work by Burgess and Wheeler (Trans. Chem. Soc., 1914, 105, 2598; J.S.C.I., 1914, 33, 1194), which showed that if the oxygen content of the air was reduced below 13·25 per cent. no mixture of methane with such an atmosphere was capable of propagating flame. The same point, and also the effect of added carbon dioxide, has been studied by Clement (U.S.A. Bureau of Mines, Tech. Paper 43, 1913; J.S.C.I., 1913, 32, 1149). This use of inert gas was first suggested by Bunte, and finds application in the patents of Martini and Hüneke (Ger. Pats. 146161, 149086, 150712 and 153703; see J.S.C.I., 1910, 29, 547) and others dealing with the safe transfer and storage of inflammable liquids. The addition of carbon tetrachloride, used largely in fire extinguishers, has been suggested by many authors as a means of rendering liquids non-inflammable, but according to Pfister (Z. angew. Chem., 1905, 22, 1786) the quantity required to be thoroughly effective is far greater than the volume of liquid treated. Evaporation of the liquid during storage may be reduced by a reduction of the surface

exposed to air (Grebel, Gas J., 1918, 143, 302). Safety devices have also been adopted to prevent the passage of flame from one vessel to another.

Methods of extinguishing burning liquids are discussed by Burrell (U.S.A. Bureau of Mines, Tech. Paper 127, 1915), who also describes the precautions necessary in handling inflammable liquids.

In general, the precautions to be taken to prevent explosions will depend upon the individual process, but enough will have been said to indicate the factors to be considered in devising suitable methods.

TABLE.

Substance	Lower limit	Corresponding temp.	Upper limit	Corresponding temp.
	%	°C	%	°C
Benzene ... ...*	1·4	−5	4·7	5
Toluene	1·4	7	4·7	30
Ethyl Alcohol	4·0	15	13·6*	35
Methyl Alcohol ...	7·8	13	18·0	26
Ethyl Ether	1·8	Below −30	5·2	−28
Acetone	2·35†	Below 20	8·5†	Below 20
Carbon Bisulphide ...	4·1	Below 20	—	—
Petroleum Benzine...	1·1	—	3·8	—
Gasoline	1·5‡	—	5·3‡	—
Pentane	1·35§	Below 0	4·50§	Below 0

* Bunte and Eitner, J. Gas. Wasser., 1901, 44, 835; 1902, 45, 1; J.S.C.I., 1902, 21, 32.

† Wheeler and Whitaker, Trans. Chem. Soc., 1917, 111, 267; J.S.C.I., 1917, 36, 587.

‡ Burrell and Boyd, U.S.A. Bureau of Mines, Tech. Paper 115, 1915; J.S.C.I., 1915, 34, 603.

§ Burgess and Wheeler; quoted by Thornton, Proc. R. Soc., 1914, 902, 76.

The limits of inflammability are expressed in percentages by volume, and refer to the downward propagation of flame. Unless otherwise stated the determinations are by Kubierschky (Z. angew. Chem., 1901, 14, 129; J.S.C.I., 1901, 20, 345).

The "Limit Temperatures" have been calculated from the vapour pressures recorded in Landolt and Bornstein's Physikalisch-Chemische Tabellen, 1912.

CHEMICAL TECHNOLOGY AT THE IMPERIAL COLLEGE OF SCIENCE.

In order to meet adequately the prospective requirements of the post-war situation, it is proposed to reorganise the Department of Chemical Technology so as to include the following four principal sections:—

A.—*Fuel Technology and Chemistry of Gases, with Refractory Materials.*

It is suggested that this group of subjects shall be located in the existing Fuel Block, considerably enlarged and extended so as to provide accommodation for the following subjects:—(*a*) General fuel technology, and the constitution of peats, lignites, and coals; (*b*) the carbonisation of coal and wood distillation; (*c*) the chemistry of coal tar, ammonia, and the manufacture of intermediate products from coal tar; (*d*) the chemistry of gases and technical gas catalysis, with special reference to the new developments in the manufacture of ammonia, nitric acid, sulphuric anhydride, etc., resulting from the war; (*e*) refractory materials, clays, earths, and sands, used in furnace construction and the manufacture of ceramics, glass, and cements; and (*f*) technical analysis connected with the foregoing.

The arrangements contemplated under (*e*) would include some provision for investigating the materials used in the manufacture of optical glass, which it is hoped will be a useful adjunct to the new Department of Technical Optics; those under (*b*) meet the need of an adequate provision being made in this country for the scientific study of wood distillation, etc., in the interests of India and the Empire generally; and those under (*a*) will provide for an extension of the investigations on lignites which have already been conducted during the war, in the interests of the Dominions.

B.—*Chemical Engineering.*

This section will be provided with suitable drawing offices and laboratories for advanced study and investigations upon:—

(*a*) The materials and principles involved in the design, construction, and use of plant for general factory operations. (*b*) The design and construction of foundations, flues, chimneys, etc. (*c*) Factory economics and organisation.

The underlying idea of this section of the department's work is that students shall be trained in the working out of designs of commercial plant from their own notes and experimental work, including the drawing up of plans and specifications, and the organisation of factories in which the abovementioned operations are carried out.

C.—*Electro-Chemistry.*

This section will be developed so as to include broadly the principal applications of electricity to chemical industry, and especially to the many processes which are dependent upon the electrolytic or ionising actions of currents. These include, *inter alia*, the manufacture of caustic alkalis, chlorine, hypochlorites, etc.; "peroxidised" products such as persulphates, perchlorates, permanganates, etc.; also white lead, and such metals as sodium, magnesium, aluminium, calcium, and electrolytic "reduction" and "oxidation" of organic substances.

D.—*Technology of Carbohydrates, Fats, Oils, and Rubber.*

The selection of the subjects to be included under this section has been largely influenced by two considerations, namely:—

(1) The already large provision (*a*) in Manchester, Leeds, and Huddersfield, for advanced study and research upon Dyes and Tinctorial Chemistry, as applied to the great textile industries of the country; (*b*) in Leeds and in London in connexion with the leather industries; and (*c*) in Birmingham in respect of the fermentation industries; and (2) the lack of any really adequate provision in this country for the needs of equally important branches of industry which depend upon the extraction and refining of certain well-defined groups of natural (and chiefly vegetable) raw materials.

The technology of the following groups of natural products has been selected because of their increasing economic importance, and of their close relationships with the work already developed in the Botany Department. It can scarcely be doubted that the study and investigation of their chemical properties, treatment, and uses will constitute an important link with the economic development of the vegetable resources of the Empire. The products in question are as follows:—(i) Celluloses, sugars, starches, gums, dextrins, and resins; (ii) animal and vegetable oils and fats, and the manufacture of glycerin, soap, and food products (*e.g.*, margarine) therefrom; (iii) rubber, and similar materials.

The additional financial requirements for the developments outlined above are estimated at £100,000 for buildings and equipment, and not less than £10,000 a year for maintenance and working expenses.

SOCIETY OF CHEMICAL INDUSTRY.

LUNCHEON IN HONOUR OF M. PAUL KESTNER.

M. Paul Kestner, President of the Société de Chimie Industrielle, was entertained at luncheon at the Cannon Street Hotel, E.C., on November 4, by the Council of the Society and the Committee of the London Section. Prof. Henry Louis presided over a large gathering, which included representatives of chemical industries, of many societies connected with pure and applied chemistry and allied sciences, Government Departments, the Corporation of the City of London, and of the scientific and daily press.

After the toast of the King and the President of the French Republic had been duly honoured, that of the Société de Chimie Industrielle, coupled with the name of M. Paul Kestner, was proposed by the chairman.

Prof. Louis said that he was glad to have the privilege of bidding a hearty welcome in this country to M. Kestner, the distinguished president of the French Society. His presence on this occasion was welcomed as a proof of the reciprocal good feeling that existed between the chemical industries of the two great allied nations, and as an earnest of their fixed intention to work together cordially and amicably for the common good of both, and to extend to the domain of industry the career of victory that had been initiated on the battlefield. There was every reason why these two societies and the important industries which they represented should work together in the fullest harmony, for their aims and objects were identical, just as were the difficulties that they had to overcome and the problems that they had to attack. It was to be regretted that this identity of aim was not more fully recognised. Much was heard of national reconstruction—surely international reconstruction should also be considered, and the joint efforts of the technologists of the allied nations be directed towards the solution of problems that had to be solved in common.

The rapid extension of a number of chemical manufactures within the last few years gave ample proof of the energy and vitality of the industry. Its fuller development in the future depended upon the measure of its control of the four essentials: raw materials, fuel, labour and technical administration. The allies commanded abundant supplies of all raw materials required in chemical manufacture, except only one, of which Germany, owing to a geological accident, had hitherto held the monopoly. Germany knew that her modes of warfare had justly brought her into such universal detestation that no nation would willingly resume relations with her, but she counted upon her potash monopoly to compel them to recommence commercial intercourse. He thought, however, that M. Kestner would be able to show in the lecture that he was to give to the Society that evening, that when France re-entered into possession of the Provinces that had been torn from her, potash would be a German monopoly no longer. In this respect the restitution of Alsace to France concerned deeply all the allies and not France alone, and this particular aspect of chemical industry assumed a world-wide significance. Speaking purely from the economic standpoint, and putting aside all considerations of political expediency or even of national equity, he maintained emphatically that the question of Alsace-Lorraine must never be left to negotiation, but its solution as demanded by France must be a condition in the first line of any peace terms. In respect of fuel, the aims of both countries were identical even though their positions might be somewhat different. Coal was admittedly the life-blood of industry, and this was just as true of the chemical industry as of any other. We in this country were for the first time beginning to feel disagreeably how vital to us was a steady continuance of this supply. France had always depended upon us for a portion of her coal supply and at the present moment, when her principal coalfield had been wrecked by the enemy, was dependent more than ever. It would certainly take some years before she could resume production even on her pre-war scale because owing to its geological structure the Pas de Calais coalfield was particularly easy to wreck and particularly difficult to restore. Therefore the coal position in Great Britain was of great interest to France, and it was our duty emphatically to assure our French friends that our natural coal resources were still fully equal to any demands that could be made upon them, and that our present coal shortage was due mainly to maladministration of those resources and not to any falling off in the productiveness of the coalfields themselves. The labour problem presented itself with equal acuteness in both countries; in both we should have to face a great shortage of labour and a great rise in its cost. No one conversant with labour conditions expected or even desired to see wages back at their old level. We wished to see labour so paid that every man who did an honest day's work should be able to live and bring up his family in decency and comfort, but we also demanded that the workman should do a fair day's work for a fair day's wage, and that all artificial restrictions of output should be done away with. The scarcity of labour would compel all industries—and the chemical industry as much as any—to rely more and more on mechanical devices, and these in their turn would demand a more intelligent and more highly trained body of workmen. He could fairly claim that both societies were doing all in their power to promote the higher training of workmen engaged in the chemical industry in their respective countries, and he was sure that their close co-operation would help to forward this important object. Lastly, the main work of both societies lay more especially in assisting in the fuller scientific education of the administrative staffs of the chemical manufactories, and in bringing science and industry into closer and more effective co-ordination. In this aim, more particularly, cordial and intimate relations between the two societies, securing that any scientific and technical advance in one country would be immediately available for the industries of the other, must work and would work for the common good of both countries. It was a great tribute to the energy and ability of M. Kestner and those associated with him that they had been able to found a society of industrial chemistry in France at a time when their country was in the throes of a conflict straining every fibre of the nation's strength, and when, moreover, their chief industrial centres were held in the grip of the enemy. In spite of such difficulties, the society was founded and its success was instantaneous and complete, due in great measure to the liberal financial support accorded to it by French manufacturers, who were prompt to appreciate the value to them of a strong technical society. It was worth recording that the French Société de Chimie Industrielle had in the eighteen months since its foundation received financial support many times as great as had been given to the British Society of Chemical Industry in all the 37 years of its existence. A society so started and so supported as the Société de Chimie Industrielle could not fail to have a successful

career before it, and he looked forward to close and fruitful co-operation with it for the advantage of the chemical industries of both countries. Their heartiest good wishes went out to the new society, and that meeting might well be taken as an expression of their good will towards it and their confidence in it. He also thanked the many guests who had been good enough to accept the invitation to the luncheon, for their presence was an indication that they were also anxious to do honour to the Société de Chimie Industrielle and to its eminent president, whom they welcomed not only in that capacity but also as one who had rendered most signal service in many branches of the chemical industry. In one respect his work was peculiarly interesting to us in this country, seeing how deeply British interests were involved not only in a cheap and abundant coal supply but also in its efficient industrial uses. M. Kestner had shown us how to bring the economical use of fuel in certain operations to an extremely high pitch of perfection by the practical application of the principles of physical chemistry, and his success in this domain had accordingly a special value in this country. They were glad of the opportunity of welcoming the distinguished French technologist who had so successfully realised what he might describe as the basal object of the Society, the complete co-ordination of scientific principles and industrial practice.

M. Kestner, replying to the toast, said: I have to thank Prof. Louis for his kind words to me and for his touching reference to my country. I thank Dr. Keane, and the Committee of the London Section, for their genial reception and for the hearty welcome given to the Société de Chimie Industrielle of France in the person of its president. We feel towards you as a younger sister seeking for advice, and we shall always try to follow in your steps. This is indeed a true manifestation of the *Entente Cordiale*, and I feel proud that it should be given to me to represent the French chemical industry on such an occasion. Whenever I look back and recall past gatherings at Liverpool, Manchester, Birmingham, Leeds and London I think of our Society as a large family circle and I feel proud of being one of the first members of that circle. It is a great joy to me to meet again so many friends in your midst, reminding me of those annual meetings which were always so cordial and instructive. It was recollections such as these that prompted me to promote the Société de Chimie Industrielle, in forming which we endeavoured to follow the splendid example set by the Society of Chemical Industry, which we shall always consider to be our elder sister; also in the conduct of our journal, *Chimie et Industrie*, our aim has been to approach the perfection of the Journal of your Society. Our object now is to establish for the future a close collaboration between our two societies, to forge bonds of fellowship, and to draw up a common programme for pacific warfare. The great pioneers of the chemical industry, and I refer specially to the alkali industry in which I started my career, have traced for us a programme. They have led the way in associating our two countries in all the great discoveries which laid the foundations of this industry. On the one side we have Muspratt, Chance, Weldon, Deacon, Brunner, Mond, and so many others, whose names are on our lips, and on the other side, Leblanc, Gay Lussac, Kuhlmann, Pechiney, and why not add the great personality of Solvay, since we are so near to Belgium? The Society of Chemical Industry was founded by the inheritors of the traditions of the great pioneers of the English alkali industry, and it is very largely due to this fact that England has no cause to be jealous of Germany. A supremacy of German chemical industry has never existed except in the domain of organic chemistry. In mineral chemistry, in electro-chemistry and in biological chemistry, I venture to say that our allied countries have been outstripped by no one. We formerly had a great respect for German chemistry, and rightly so, but during this war the Germans have defiled their chemistry by pressing it into the service of destructive and infamous inventions forbidden by international conventions, which no right-minded man can countenance. Therefore, whatever may be the terms imposed upon Germany by the peace treaty, the punishment will never be sufficient for so many crimes. The Germans have introduced their methods of warfare to another field. They have conceived war as a *raison d'être* for transferring to Germany all the wealth of the invaded countries and thus ruining them for ever for the benefit of the invaders; above all factories must be destroyed, so as to kill further competition. This diabolical policy has been tersely summed up by Frederick Naumann in *Demokratie und Kaisertum*: "War is not a struggle between military forces for the sake of a few annexations, or commercial advantages; its only object nowadays is to benefit the economic development of the country. It is therefore necessary to exhaust and ruin the country occupied and its industry by requisitioning both material and machinery"; and this policy the Germans would undoubtedly have carried out here, had they succeeded in getting to England. When, after the war, the Germans come back to us to sell their wares, it will be our imperative duty to remind them of the words of Naumann, and ask them "What guarantee are you giving us that your articles have not been manufactured with stolen material? And what guarantee that the capital of your firm is not stolen money?" But in order to facilitate our reply, we have another equally imperative duty, *viz.*, that of organising ourselves in every sphere with a view to producing that which, before the war, Germany compelled us to import. We shall then be able to add to our reply, "All these goods you are offering us, which formerly you alone made, can now be got in our own country, and if they are a little dearer, we prefer to pay the difference." Let us keep in touch and unite our efforts. Let us help one another so as to wage in the sphere of economics a war which must last until Germany has paid the full penalty. Of all industries the chemical industry is perhaps that where the contest will be fiercest. Towards maintaining such contact, and carrying out such a co-ordination of efforts, I think our societies can do a great deal. We are determined to set to work at once. Gentlemen, British and French hearts have learned to understand and respect one another during a period of endurance and strife; henceforth in victory and triumph they will beat in unison. I drink to the union of the two societies, to the union of English and French hearts and minds.

The Rt. Hon. Lord Moulton proposed "The Society of Chemical Industry." From his boyhood, he said, he had wondered at the mysteries of chemistry, and through all the years since then he had watched the advance of chemical knowledge with admiration and delight. Not only had it achieved wonders which had never been anticipated, but it had acquired the power of ascertaining the secret processes by which nature had been working from the commencement of the world, and had learned to imitate its action and produce those things which it had been thought could only be obtained from nature. His task was even more congenial than drinking the health of these societies and the great men who were devoted to the advancement of chemical knowledge. He was speaking for the advance of chemical industry. They might well take for their motto those old words in the Charter of the Institution of Civil Engineers which

defined the aim of the engineer as to turn the forces of nature into the service of man. The Society of Chemical Industry had for its object to take this wealth of chemical knowledge and not only add to it but to turn it to the service of man. In England the chemical industry had been neglected through all these long years and, whether as a cause or consequence of that neglect, it was little thought of by the public. They had no idea of the boundless wealth which was at their disposal in the hands of the chemical industry. They considered the chemical industry as rather a nuisance; not nearly as respectable as the other industries, and they felt little interest in it. But this had changed because England had been thrown on its utmost resources by the strain of this war, and he was delighted to be speaking at that moment because we were standing at the dividing line between peace and war, and if he wanted to demonstrate the importance of the chemical industry he would take its powers and duties in these two states; what it had got to do in war and what it had got to do in peace. They were widely distinct. What it had got to do in war he was qualified to speak of as very few others. He found himself placed in a position at the beginning of the war when the whole of his reliance had to be put on the chemical industries; chemical industries which ought to have existed, but which for the most part did not exist, had to be created and fostered. The power of the Germans in this war was due to the development of their chemical industries to which they could appeal to an almost unlimited extent. In this country we had, as it were, to improvise them, and yet throughout all this long war and throughout the almost immeasurable demands upon the output of the country, the chemical industries had answered his call and the call of the country so well that he could say they had never kept a shell waiting. What then was the peculiarity of the work of the chemical industries in war? We had learned that in war, a country must depend upon itself. It was never safe if it had to get its resources from other countries, and therefore, heedless of the cost, we had been obliged to extemporise new industries and to do, whether economical or not, things we should never have thought of before. In passing from war to peace our duty was to do all that was demanded of them better and more cheaply than our rivals; he emphasised "more cheaply," and would have all members of the Society of Chemical Industry treat these words with reverence and not with scorn. To do their work more cheaply meant that they had to do it with less human labour; that the benefit of their work was obtained with less toil and suffering. Therefore, they had to look forward in the future to mastering their tools and the knowledge that chemistry had put into their hands, so completely that their work was of a higher class and of a lower cost than that of those who would try to tempt this country to rely for its supplies on countries outside. That was the special task of the chemical industries. They had to turn chemistry to the use of man, and he was delighted to find a flourishing Society like this boldly putting that as its title. With these views he called on them with great confidence to drink to the future prosperity of the Society of Chemical Industry, and he coupled this with the name of someone singled out to reply —and he could not name a better—Dr. Charles Carpenter.

Dr. C. Carpenter, replying to the toast, said that as he listened to the eloquent language of Lord Moulton he could not help feeling that there was the finished product, and that the most he could hope to offer was the crude raw material. Were it not for that he might have drawn a vivid picture of what the Society of Chemical Industry had done in the 37 years of its existence. He might have gone back to the beginning in 1881 and pictured that enthusiastic group of energetic young men whose hearts and souls were in applied chemistry. He might have pictured their meeting together and the enthusiasm with which they laid the foundation of the Society which to-day was—and in the future would be still more—a mighty force throughout Great Britain. He could not help feeling regret that one at least of that band had not lived to be present on this great occasion. He referred to the late Mr. Thomas Tyrer. For many dark years the Society, and even the industry itself, might have been likened to those priests who in caves and hidden dwellings carried on the secret rites of an unpopular religion confident that one day the truth of its teaching and its precepts would be recognised by the world. What would have been the position when the country cried aloud for the help of the god of chemistry—if he might so put it—when it called upon chemistry to help it in its sorest hour of need? What would have been the position if no Society of Chemical Industry had existed? What it had done in the past in fostering all branches of chemistry throughout the United Kingdom was a very good starting point for all its tasks in the future. One of the more important of these was to co-operate with the French society, which had been founded in a manner almost miraculous, when one considered the stress of circumstances under which it had been born.

Another was to be found in the promotion of chemical engineering. There had lately been a suggestion that a separate organisation of the Society should be formed with this particular object in view, and having regard to the great difficulties which had existed during the past four years in the development of that important branch of applied chemistry, he felt it was a good omen for the future that the Society should have so realised the great importance of that branch that it had looked with a favourable eye upon the suggestion for individual development within the four corners of the Society itself. Much that he might have said with regard to the Society had already been touched upon, but he might with pride add that the Society which began with 300 members in 1881 in all probability would have 5000 members by the end of the present year. That conveyed a suggestion of healthiness and fertility, and if they could only persuade the authorities to take chemical knowledge and chemical teaching into their fold, and do something by which the young were given some inspiration in respect of it, that instead of being inspired by chemistry as an accident they were inspired by it in the same way that history was used, or should be used, to inspire their patriotism; if something could be done in that way he felt there would be greater hope in the future than the past would warrant us to expect. They must also be careful that those to whom they entrusted the government of the country should not take too narrow a view and weigh up the country's need in respect of the chemical industry merely in terms of £ *s. d.* He could not conceive that even that goal of cheapness which Lord Moulton had spoken of, and which should be the aim of every producer, would be the only consideration. Surely a broader view should be taken and the importance of chemical knowledge recognised. Even if that cost something and funds had to be provided directly or indirectly by the State, he believed they would all agree that it was of the highest importance that that aspect of affairs should not be overlooked, and that there should be no reversion to pre-war conditions.

Subsequently to the luncheon, the company was entertained at tea by the Rt. Hon. the Lord Mayor at the Mansion House.

THE STREATFEILD MEMORIAL LECTURE.

The first of this series of memorial lectures was delivered by Prof. W. J. Pope, President of the Chemical Society, at the Technical College, Finsbury, on October 17.

In opening the proceedings the chairman, Prof. G. T. Morgan, said that since the death of Mr. F. W. Streatfeild in March last his former students had subscribed at the rate of £1 per day to a fund intended to institute this series of annual lectures, and to found a prize for practical chemistry to be awarded annually to the most meritorious senior chemical student of the college.

Streatfeild joined the chemical staff when the college was opened in 1883 and as a pre-eminently practical teacher contributed so largely to the training of many successive generations of students that he is to be regarded as the creator of the Finsbury chemical student, a type of chemist who is to be found in charge of industrial operations throughout the British Empire and in other parts of the world. The Memorial Committee had been fortunate in securing for the first lecture the services of Prof. Pope, who had been one of Streatfield's earliest students.

The Lecturer paid grateful testimony to the sterling worth of the early college teachers, Streatfeild, Castell-Evans, Meldola, Silvanus Thompson and Ayrton, who had all now passed away.

Streatfeild commenced his chemical career with Nevile and Winther in Lincolnshire and with Dr. Japp at the Royal College of Science, afterwards pursuing his chosen branch of the subject—organic chemistry—at the Finsbury Technical College with Professor Armstrong and later with Professor Meldola.

Although Streatfeild's time was fully occupied in teaching, he yet performed much original research, and he had the habit of combining these two activities in a curiously intricate fashion. His former students owe much to the readiness and enthusiasm with which this accomplished chemist placed his experimental skill and intimate knowledge of the science at their disposal. As a man, Streatfeild was characterised by unworldliness and by a lively sense of humour; he was one of those who belonged to the nobility of achievement and intellectual attainment, which is at least equal to nobility of birth.

The Lecturer pointed out that there were three periods discernible in the historical development of the teaching and study of pure and applied science in Great Britain.

First the half-century preceding 1914 when progress was comparatively slow owing to the apathy of the general public towards all branches of exact knowledge. In the early 'eighties great Livery Companies of the City of London combined for the promotion of technical and scientific education in this country, and established and financed first the Finsbury Technical College and a year or two later the Central Institution at South Kensington. Both these institutions were designed to popularise scientific and technical education and to counteract to some extent the exclusiveness of Oxford and Cambridge at a period when those universities contributed but little to advanced teaching in pure and applied science. The new movement rapidly became fruitful, not only in pouring a host of well-trained workers into the scientific industries of the country, but also in stimulating other public bodies to emulation and competitive action. It is to be regretted that the original scheme was not raised above this competition by a further spontaneous effort of its initiators, although it still fulfils an essential function among the educational institutions of the country.

The second period, one of transition, embraces the last four years, and is rapidly coming to an end. In the autumn of 1914 practically all branches of technical production were on the verge of breakdown owing to the sudden arrest of imports of numberless chemical and engineering products, many of small financial importance but all essential to our technical production. The nation realised suddenly but tardily that the neglect of applied science had brought us to the brink of ruin. The last four years of transition have been a period of unprecedented technical activity in Great Britain. During this time industrialists have had to learn how to manufacture many scientific products which were previously purchased ready-made from abroad, and the whole country has become one vast chemical and engineering workshop. The rapidity with which this country has organised her scientific industries, and brought them to a production of essentials far exceeding that of Central Europe, is entirely miraculous.

The third period, the period of reconstruction, is in the immediate future, and it is evident that it will be accompanied by unexampled developments on both the chemical and engineering sides of technical science. During the past four years a vast provision of chemical and engineering equipments has been accumulated and our country has regained the utilisation of all the raw materials of the Empire. Our people have learnt, moreover, that the exploitation of these materials by Germany was due to our neglect of applied science and more particularly of chemical technology. Our country has now become an enormous producer of such fundamental chemicals as fuming sulphuric and nitric acids, prime essentials of a flourishing chemical industry. The manufacture of fine chemicals such as coal-tar dyes and pharmaceutical products, and of rare metals such as tungsten, has been installed hurriedly and would require years of careful technical investigation for the improvement of methods and the establishment of these processes on an economic basis. Inasmuch as success in applied science is only possible through intensive cultivation of pure science, it is to be foreseen that before us lies a period of great scientific and technical activity.

Streatfeild and his contemporaries, the men of the first period, have largely passed away. The Lecturer's contemporaries are expending their energies in the second period, that of transition. On the students of to-day the coming work of reconstruction will fall, and they can gain inspiration from a contemplation of the enthusiasm displayed by Streatfeild and his colleagues in the performance of their duties and of the success which attended their efforts towards the public welfare.

Sir Edward Busk, in moving a vote of thanks to Prof. Pope, referred to the indifference which existed prior to the war regarding applied chemistry, an indifference connected, undoubtedly, with the immense accumulation of wealth and general prosperity which had befallen the British nation. We had had a rude awakening from this apathy.

Dr. M. O. Forster and Messrs. J. L. Baker and F. H. Carr referred in grateful terms to the personal traits and scientific qualifications of their former teacher, the late Mr. F. W. Streatfeild, and to the value of his life work in the training of workers in applied chemistry.

THE SALTERS' INSTITUTE OF INDUSTRIAL CHEMISTRY.—Dr. M. O. Forster, hon. treasurer of the Chemical Society and since July, 1915, chairman of the Technical Committee of British Dyes, Ltd., has been appointed Director of this new Institute.

NEWS FROM THE SECTIONS.

LIVERPOOL.

At the first meeting of the session, held at the University on October 25, Mr. A. J. Smith presiding, Prof. J. W. Hinchley delivered an address on "The Objects and Constitution of the Proposed Chemical Engineering Group of the Society."

Forty years ago there arose a need for an organisation of those interested in chemical industry to perform educational and other functions; in 1880 a Society of Chemical Engineers was formed, but this gradually fell away and was now defunct.

The Society of Chemical Industry, however, grew and flourished and to-day was a successful organisation possessing a most valuable journal devoted to many branches of technical chemistry. Since the early days other societies have sprung up in chemical circles—*e.g.* the Faraday, Ceramic, Oil and Colour, etc., and it has been felt by some that if subject-sections or groups were formed within the Society to meet the wants of the various branches, much overlapping would be avoided and chemical industry as a whole would benefit thereby.

The Society has done well so far as the local sections are concerned, but something more is wanted—*i.e.* amalgamation of other societies under one federal body with groups dealing with different branches of chemical industry. These groups would be autonomous and each would be primarily concerned with its own particular subject, thus affording more individual specialisation, so that the whole body of members of the Society would gain valuable information on a variety of subjects.

Conferences should be held at different places up and down the country lasting throughout an afternoon and evening, with a break for discussion and interchange of views on the subject in hand.

The committee of the proposed Chemical Engineering Group also suggests that a central bureau of information should be available, and it is proposed to keep in touch with modern improvements in connexion with the materials of engineering. Standards should be set up so that parts of chemical plant, etc., would be interchangeable and easily replaced; a technological library should be established, including an up-to-date collection of technical catalogues of machinery, etc., to facilitate quick reference. All these improvements would mean the saving of time and energy and if necessary, those using these departments would be required to pay suitable fees.

A research fund, under the control of the Group, should be reserved for chemical engineering subjects—the researchers to be adequately paid.

There is a big need for a proper collection of chemical engineering data, and if this were undertaken by the Group it would prove a boon to designers of chemical plant.

In the future such a Group might even form an Institute which could confer degrees or diplomas, for there are comparatively few chemical engineers in this country, and in the future we must "grow" them; this would assuredly be best effected by a movement originating within the ranks of the parent body—the Society of Chemical Industry.

NOTTINGHAM.

The opening meeting of the session was held on October 30 in the University College. There was a large attendance, including a number of ladies.

The Chairman, Mr. F. H. Carr, gave an inaugural address on "The Synthetic Organic Chemical Industry," a report of which will appear in our next issue.

Mr. J. T. Wood then gave an account of his work on the preparation of solutions of pure enzymes, which showed that trypsin was precipitated from solution by safranin, together with proteid matter; but that on account of its ready solubility the enzyme could be subsequently dissolved by water, leaving behind the proteid matter.

GLASGOW.

At the opening meeting on October 29, Mr. Quintin Moore in the chair, Capt. C. J. Goodwin gave an address on "The Proposed Engineering Group," in the course of which he deplored the overlapping, the waste of administrative effort, and the weakening of the parent society caused by the formation of separate societies dealing with branches of chemical industry. Prior to the war, progress in chemical engineering had been greatly retarded by the absence of scientific control, the perpetuation of bad designs by chemical contractors, and by the refusal of individual chemical manufacturers to interchange information or to publish data which would be of use to the whole industry. After describing fully the projected activities of the Group, Capt. Goodwin announced that its prospective membership was already 900, and that 88 per cent. of the replies received to the questionnaire were entirely favourable to the formation of the Group. Prof. C. H. Desch agreed in the main with the proposal, but hoped that the Group would not specialise too much or too rigidly. This view was shared by Mr. W. Rintoul, who heartily supported the establishing of a bureau of information. The movement was also strongly approved by Messrs. W. S. Herriot, Purvis and W. H. Coleman.

LONDON.

An account of the proceedings at the luncheon given in honour of M. Paul Kestner and the Société de Chimie Industrielle, and of the evening meeting, will be found on pp. 405, 409 of this issue. M. Kestner's paper on the Alsatian potash deposits is given in full in the Transactions (this issue, pp. 291—299).

A SYSTEM OF FILING PAPERS, ETC. BY SUBJECT.

M. DE WHALLEY.

With reference to my article (this J., 1918, 317 R) and an alternative system suggested by Mr. H. Droop Richmond (377 R), I would state that the purely alphabetical arrangement, although the earliest and simplest, is unsafe, even for the small outfit suitable for the more or less private collection of notes and cuttings described by me. The mere recording of the name of a subject on a permanent guide shows that such a folder exists, whether it be in its correct place or lying hidden on the desk. Here lies half the trouble with a purely alphabetical system.

Classification under the simple letters of the alphabet is quite sufficient when dealing with not more than 100 main subjects, and in such a case there would not be more than about 10 to any one guide, reference being almost instantaneous. If many more than 100 main subjects are likely to be dealt with, the main guides would be lettered Aa—Al, Am—Az, Ba—Bk, and so on to any extent, thus reducing the number of subjects per guide card.

The possibilities, explained in the last paragraph of Mr. Richmond's article, of connecting up other data to the filing system, are without exception as applicable to the system described in my article as to any other filing system. Conversely, cross referencing the filing system to other data is facilitated when the folders are numbered.

MEETINGS OF OTHER SOCIETIES.

THE SOCIETY OF GLASS TECHNOLOGY.

The first meeting of the new session was held on October 23 in the University, Sheffield. Dr. M. W. Travers, who presided, referred to the great loss the glass industry has suffered in the death of Mr. A. S. Esslemont, Controller of Optical Munitions and Glassware Supply.

A report of the activities of the Society since the June meeting was given by Dr. Turner, the outstanding feature being the institution of a Refractories Research and Specifications Committee.

The first paper, entitled "Refractory Materials and the Glass Industry," was read by Prof. J. W. Cobb. He emphasised the fact that although temperatures in glass manufacture were by no means abnormally high, yet the nature of the chemical reactions taking place was such as to render the problem of refractories extremely difficult. There was the corrosive action of the molten glass upon the container to contend with, and in addition the corrosive action of hot dust upon flues and furnace interiors. The nature of the various refractory materials used in the glass industry was then dealt with, and the effect of grain size on the refractoriness and strength of silica bricks received thorough treatment. The paper closed with a discussion of the evil effects on refractories of penetration of glass and batch materials, and the importance of thermal conductivity.

Dr. Travers then contributed a note on "The Firing of Glass Pots." By means of a striking collection of specimens, the author showed that the life of a glass pot was materially increased if, before filling in, the pot was completely "vitrified." The reason was fully discussed and the means of effecting such vitrification described.

A third paper, on "The Requirements of Clay for Glass Pot Making," was contributed by Mr. S. N. Jenkinson. A brief survey was made of the position of the glass refractories trade both in 1914 and at the present time, and the necessity for some specification of materials was shown to be urgent. The proposed specification drawn up by the Refractories Committee for clay for pots was then dealt with and the questions of size, nature, quality and function of grog discussed.

Mr. Coad-Pryor read a short note on "The Action of Certain Types of Glass upon Pots," and discussed the reason for the quicker solution of the bottom of glass pots as opposed to the sides. Dr. Turner and Mr. J. H. Davidson contributed a short note on "The Solubility of Pot Material in Glass" and showed the influence of grain size upon rate of melting.

SOCIETY OF PUBLIC ANALYSTS.

At the meeting held on November 6, Dr. S. Rideal presiding, Mr. H Droop Richmond communicated a "Note on the Graduation of Gerber Butyrometers" in which he criticised a paper on the same subject by Day and Grimes (this J., 1918, 278 A). In the paper on "The Estimation of Cacao Shell" by Messrs. B. G. McLellan and A. W. Knapp, it was stated that the published processes give uncertain results when applied to small quantities of shell. The authors prefer the determination of fibre, although this method also contains certain inherent defects. The third paper on "The Estimation of Saccharin Tablets," by Messrs. H. D. Richmond, S. Royce, and C. A. Hill, contained a short description of the process of manufacture, and the results of the analysis of a large number of samples sold recently in Great Britain. A satisfactory method of analysis was described in lieu of the alkaline acid method (this J., 1918, 246 T), which is not applicable owing to the presence of stearic acid in the tablets. Of the "controlled" samples, the majority were well up to the prescribed strength, but the "uncontrolled" tablets were mostly well below it. The price charged for the latter was usually much above the controlled price, and the most expensive tablet was frequently almost the worst.

THE INSTITUTE OF CHEMISTRY.

At a meeting of the Council held on October 25, it was reported that Local Sections had been formed at Liverpool, Manchester, Gretna, Edinburgh and Glasgow. The Council has also approved of proposals for the formation of Sections in Birmingham, South Wales and Ireland. The Finance Committee reported that in view of the increased expenditure the question of raising the annual subscription was under its consideration. A sum of £2500 is still required to liquidate the building fund.

In connexion with the Whitley Scheme, a letter has been addressed to the Minister of Labour pointing out that modern productive industry depends to a great extent upon the work of chemists, engineers and similar technical experts, that the Industrial Councils will have to deal with such questions as technical training, industrial research, etc., and asking whether, in view of these facts, it was intended that technical experts should be represented on the Councils, and whether professional bodies representing such men would be consulted on technical matters.

The Public Appointments Committee reported on the representations made to the Corporation of Birmingham with reference to the action of the Municipal Research Laboratory in sending out pamphlets and letters soliciting practice in competition with private chemical practitioners. The Council has suggested that the differences which have arisen between the Research Laboratory and professional chemists in Birmingham should be capable of satisfactory and amicable adjustment. On the recommendation of the same committee, the Council has approved a statement on the necessity for a definitely organised Government Chemical Service, which will shortly be brought to the notice of all Government Departments concerned.

The Council elected 23 new Fellows and 88 Associates, and admitted 14 new students to the register.

BRITISH ASSOCIATION OF CHEMISTS.

A general meeting of members of the Association was held in Manchester on October 26. Prof. J. W. Hinchley presided. Very keen discussion arose over the proposal to register the Association under the Companies Act, some of the members being in favour of establishing the Association as a trade union. Dr. R. B. Foster, in moving the former proposal, advised that it should be accepted in the first place, and later, if the majority required it, the trade union principle could be adopted. It was, he said, unwise to start experimenting before the need for experiments was made perfectly clear. The original motion was eventually carried unanimously on the understanding that ample opportunity would be afforded later to reconsider the whole question.

Mr. H. W. Rowell, the Hon. General Secretary, announced that he was in touch with other scientific organisations for the purpose of co-operative action, and with the Government Departments in respect of representation on Industrial Councils and similar bodies. A registered office was to be established as headquarters of the Association, and other activities (Employment Bureau, etc.) would be organised as rapidly as possible.

NEWS AND NOTES.

CANADA.

ELECTRO-CHEMICAL INDUSTRIES.—In the *Canadian Chemical Journal* for September last two articles on the above subject are of considerable interest. The first by H. E. Randall deals with the electro-chemical industries at Shawinigan Falls in the Province of Quebec between Montreal and Quebec City. The locality is of recent origin as it was only in 1898 that it was linked up to the railway. The generating stations of the Shawinigan Falls Water and Power Co. are capable of developing some 330,000 horse-power of which 265,000 is electric and the balance hydraulic power. A further 135,000 h.p. can be developed at an early date. The locality is served by two railways and is within 20 miles of tide water on the St. Lawrence River at Three Rivers. Bituminous coal is obtainable from Novia Scotia and anthracite from the United States coalfield. Some 200,000 tons of coke and 5000 tons of petroleum coke together with 3,000,000 gallons of tar, which yields 15,000 tons of pitch, are produced annually at Montreal.

Limestone, quartz, sandstone, magnesite zinc, chromium, titanium and other ores are all available in the district. The labour conditions are stated to be very satisfactory and the locality is considered to be in every way well fitted for a considerable extension of electro-chemical activities. Many works are already established including the Northern Aluminium Co.. The Canada Carbide Co. using some 50,000 h.p. for the manufacture of calcium carbide and acetylene, The Shawinigan Electro Metals Co. using about 2500 h.p. for the production of magnesium metal, The Canadian Electrode Co., The Canadian Electro Products Co., which manufacture acetic acid, acetaldehyde, paraldehyde, acetone, etc., from acetylene supplied by the Canadian Carbide Co., and several other companies engaged in the production of low phosphorus pig-iron, aloxite, carborundum, ferro-silicon, etc. Besides the electro-chemical industries proper there are two companies engaged in making paper and pulp, the Laurentide Co. taking 28,000 and the Belgo-Canadian Co. 18,000 h.p. for this purpose.

The second article by F. A. J. Fitz-Gerald, after referring to the desire of the German industrialists to obtain command of the iron and coal deposits of Eastern France as one of the contributing causes of the present war, suggests that a need for water power may very well be the cause of a future outbreak. Aluminium, ferro-tungsten and other ferro-alloys, carbon bisulphide, sodium, abrasives, phosphorus, chlorine, caustic-soda, silicon, graphite, electrolytic zinc are among the chief of many products which can be most economically manufactured by the use of hydro-electric energy. The importance of these products will continue after the war which has given a fresh impetus to the demand for many in the list. Cheap electric energy is indispensable for their successful manufacture and Canada so richly endowed with water power possibilities has a great electro-chemical future before her.

SOUTH AFRICA.

MINERAL RESOURCES.—In his address to the Science Association of South Africa, the president stated that the Union was not only the world's chief producer of gold, diamonds and corundum, but possessed the greatest known reserves of these minerals. In the matter of coal production it stood eleventh among the countries of the world. The coal industry is making steady progress, and is capable of considerable expansion. An export trade to South America seems to offer great possibilities. In regard to reserves, it is generally conceded that the estimate of 56,000 million tons, made in 1911, is too low. The prospects of the coal by-product industry are excellent. As a result of conditions due to the war, South Africa is about to enter the ranks of the world's iron producers; four small blast furnaces are either actually completed or nearing completion. The future of the industry is largely bound up with the efforts about to be made at Pretoria, to smelt the rich titaniferous ores of the Bushveld complex in admixture with the silicious ores of the Pretoria series. The president estimated that there were over 3,000,000,000 tons of these ores available, and if they could be smelted on a large scale, using cheap Transvaal coal as fuel, South Africa would be able to make iron and steel in competition with the leading iron-producing countries. The tin mining industry is in a flourishing condition owing to the high price of the metal. —(*Iron and Coal Tr. Rev., Oct.* 13, 1918.)

AUSTRALIA.

BLYTHE RIVER IRON DEPOSITS.—The Federal Cabinet has decided to appoint an expert from Great Britain or America to report on the Blythe river iron deposits held under option by the Government.—(*Official.*)

PRODUCTION OF ALKALI.—The chairman of the Federal Alkali Committee is inquiring into the possibilities of establishing an alkali factory in the State. It is proposed to expend from half a million to a million of money on the industry.—(*Official.*)

UNITED STATES.

THE FOURTH CHEMICAL EXPOSITION.—The fourth National Exposition of Chemical Industries was held during the last week of September in the Grand Central Palace in New York City. Four years ago the exhibition occupied but a portion of one floor of this building; this year three entire floors were requisitioned. The number of exhibits was 350, and the countries represented included England, France, Russia, Canada, Mexico, Cuba, various South American countries, China, and Japan. The main interest appeared to be focussed upon chemical products suitable for international trade, and on the American types of chemical apparatus which have been developed during the war. Cities and States vied with one another in advertising the suitability of their localities for chemical industries, and much display was made of data concerning water power, transport facilities, and natural resources. Among the exhibits which attracted particular attention were compounds associated with the fixation of nitrogen as cyanide; dibromindigo, with cloth tested to show its superiority over indigo; and products illustrative of the Pacific kelp industry, *e.g.* iodine, ketones, esters, and potassium compounds. An exhibit of American-made fused quartz apparatus drew attention, especially on account of the large pieces shown, and the display of chemical glassware and porcelain showed a marked improvement in design and uniformity of product. A new nitrator of huge dimensions, for the nitration of toluol, was shown operating with water. In it the liquid can be changed at the rate of 2000 gallons in 30 seconds by means of propellers which draw it from the bottom into an outside system and discharge it at the top. Temperature control is obtained by coils, and a governor shuts off the supply of toluol in the event of danger. Another novelty was a straw gas generator designed for use in cereal-growing districts where coal is scarce.

Scientific meetings were held during the week, at which such topics as water power, potash, ceramics, etc., were discussed, and in the evenings moving pictures illustrating chemical processes and operations were exhibited. *Chemical and Metallurgical*

Engineering introduced an innovation by issuing a daily number.

The next exhibition will be held in September 1919 at Chicago.

CHEMICAL BIBLIOGRAPHIES.—Pending the time when American chemists will have to take the compilation of great reference works into their own hands, the *Journal of Industrial and Engineering Chemistry* proposes that the need should be met by making photographic reproductions. The cost of so reproducing the 11,126 pages of Beilstein would not exceed 40,000 dollars (say £8,000), and there should be no difficulty in obtaining the necessary legal permission. It is further proposed that a donor of 30,000 dollars should be found to defray the cost of the zinc etchings, and that the publication should be available to every organic chemist at the price of 10 dollars per set, as against the ordinary price of 100 dollars per set.

JAPAN.

THE NITROGEN INDUSTRY.—Before the war nearly all the raw materials used for manufacturing nitrogen compounds were imported. All the ammonium sulphate and one-third of the Chili saltpetre were used for manurial purposes, and the remaining two-thirds of the latter for explosives and other industries.

Imports of Ammonium Sulphate and Chili Saltpetre.

	Ammonium sulphate Tons	Chili Saltpetre Tons
1896	—	4,539
1900	1,730	6,440
1904	11,139	5,633
1908	65,850	5,887
1912	83,928	19,037
1913	110,634	26,539
1915	19,790	29,976
1917	14,980	54,649

The price per ton of the imported products was, for ammonium sulphate, 121·34 yen in 1900, 144·55 yen in 1913, and 191·16 yen in 1917; and for Chili saltpetre, 63·30 yen in 1896, 109·69 yen in 1913, and 177·95 yen in 1917 (yen=2*s.* 0½*d.*). The home production has been as follows:—

	Ammonium sulphate Tons	Calcium nitrate Tons
1913	7,402	2,500
1914	15,904	5,000
1915	31,571	3,500
1916	40,620	1,500
1917	52,917	—

In addition, there was produced in Manchuria 3462 tons of ammonium sulphate in 1916, and 10,178 tons in 1917. When certain works now in course of erection are completed, the estimated total production of Japan is expected to exceed 100,000 tons per annum.

Nitric acid is chiefly manufactured where it is used, most of the strong acid being produced at the Government explosives works, from which no figures of production are reported. The two largest celluloid works (Explosives Manufacturing Co. and Dyestuff Manufacturing Co.) make about 20,000 tons of strong acid yearly. The newly-established Nippon Electro-chemical Industry Co. is to make 2500 tons per annum by the Rossi arc process.

The output of by-product ammonia in 1917 was 12,900 tons (3000 tons from gas plant, 7200 tons from coke ovens, and 2700 tons from Mond gas plant). In Manchuria, the South Manchurian Railway Co. produces 5400 tons of ammonium sulphate from its Mond gas plant, and the Dalny Ammonium Sulphate Co. recovers about 250 tons from organic manure. Most of the numerous coke ovens erected since 1914 are of the beehive type, but abundant ammonia should soon be available from the rapidly expanding coke industry in connexion with iron smelting.

The production of cyanamide in recent years has been:—1914, 10,990 tons; 1915, 29,600 tons; 1916, 32,934 tons; and 1917, about 50,000 tons. The manufacture was started in 1910 by the Nippon Nitrogenous Fertiliser Co., at Kumamotoken, with a capital of 1 million yen, since increased to 10 millions. In 1912 Mr. T. Fujiyama resigned from the company and founded another, which in 1915 developed into the Electro-chemical Industry Co. with a capital of 5 million yen. The first-mentioned company has at its disposal 49,700 K.W., and the other either controls or will shortly control 48,000 K.W.

GENERAL.

THE OIL AND COLOUR CHEMISTS' ASSOCIATION.—In the course of his presidential address to this newly-formed Association on October 15, Dr. F. Mollwo Perkin made a strong plea for the standardisation of methods of testing intermediate and finished products, and he suggested that the Association should undertake the work in respect of the trades which it covers. These trades should comprise, in addition to oils, colours, and linoleum, also oil-seed crushing, rubber, and soap. Another important function of the Association would be to publish a journal of abstracts, and this the Council had decided to do even if it involved the expenditure of all its assets. He was aware that a great deal was published already, but the abstracts they required were difficult to get hold of.

THE HARDNESS OF METALS.—At the last meeting of the Manchester Literary and Philosophical Society, Prof. C. A. Edwards gave an account of various methods of making hardness determinations, and described a new apparatus which was designed for making hardness tests at high temperatures. He also gave data showing that the hardness of pure solid elements is a periodic function of their atomic weight.

EXPLOSIVES SUPPLIES.—A special article in the *Board of Trade Journal* (October 10, 1918) gives an account of the work done by the Explosives Supply Branch of the Ministry of Munitions in controlling and developing the supplies of glycerin, alcohol, and coal-tar derivatives.

All the stocks and production of glycerin were requisitioned in August 1915, the prices being fixed by agreement with the soap and candle trades at £59 10*s.* per ton for crude, and £87 per ton for "dynamite" quality. This arrangement proved very advantageous to the Government, for the price of glycerin in free markets has since fluctuated between £300 and £185 per ton for the first quality. Monthly reports as to the present and prospective outputs of each works have been made to the Department, so that the latter has been able to distribute the material as required among the explosive factories. At first deliveries for trade purposes were allowed on monthly licences, but as supplies became shorter these were gradually cut down until, in January 1917, the normal consumption of 400 tons per month had been reduced to 10 tons. It has been found possible in most cases to eliminate the use of glycerin or to employ substitutes, *e.g.* for baking, perfumery, textiles, leather, and even in medicine, but it appears that glycerin is essential for printing, ship's telemeters, and for scientific purposes.

The various stages in the reduction of the manufacture of potable spirits culminated in March 1917, when the manufacture of potable grain spirit was completely stopped. The patent still distilleries were the only plants capable of producing spirit of sufficient strength for explosive manufacture, and of these plants the six largest were taken over for the manufacture of acetone by the Weizmann process. The remaining 21 distilleries continued working at full output of strong spirit until early in 1917.

The non-yeast plants were then shut down owing to shortage of tonnage for grain, but the yeast-producing plants were retained in order to ensure supplies of yeast for bread making. It soon became evident that the production from the yeast distilleries would not meet the demand for essential war purposes, and an advisory committee was appointed. After full consideration, especially as regards yeast supply, the committee recommended the continued working of the yeast distilleries, and advised that increased supplies of alcohol should be obtained by working up molasses, of which there was a large quantity available provided tonnage could be obtained. The requisite tank steamer tonnage was found, and the necessary output of alcohol was obtained. In March of this year the demand for alcohol abated, and the distillation from molasses was discontinued, the greater part of the tank tonnage was returned to the Admiralty, and the small quantities of molasses still being imported were handed over to the Ministry of Food for cattle feeding. Since that time a sufficient output of alcohol has been obtained from the yeast distilleries. At the time of acute shortage a considerable quantity of spirit was imported from British Guiana.

Restrictions were placed on dealings in coal-tar in October 1917, the object being to obtain a maximum output of creosote (fuel oil) for the Navy. Although the total possible production of tar oils is only a fraction of the total naval requirements, every extra quantity of home-produced oil means saving of tank steamer tonnage. By checking the returns of producers and distillers against one another, the control has been as complete as is possible with so large a number of producers (nearly 2000 in all). To meet the demand for road tar, the Ministry allotted a bulk supply of dehydrated tar to the Road Board, which distributed it to the local authorities by means of supplementary licences. In a few cases small quantities of crude tar have been licensed for road work where the use of refined tar would have involved extra expense and transport. The Ministry has had complete control of benzol and toluol since 1915, but solvent and heavy naphthas did not come under the licence system until January 1918.

Lignite Industry in Greece.—In pre-war days, when Cardiff coal was delivered to Greece at 19*s.* per ton, there was very little demand for native lignite, which with a calorific value half that of coal was priced at 13*s.* to 14*s.* per ton. When war conditions caused a falling off of coal imports—112,000 tons were imported in 1916, against 540,000 in 1914—it became necessary to exploit the lignite deposits, and the production has risen from 170 tons in 1913 to 153,000 tons in 1917. The Government Department, "La Direction Supérieure des Transports," is specially charged with the development of this material.

It is doubtful whether Greek lignite will be able to compete with coal after the war, but, with improved methods of working, it is hoped that the larger firms will be able to continue working. In this connexion it must be remembered that before the war it was usual for ships that were going to the Black Sea for wheat to carry coal to Greece at a low freight instead of going out in ballast. Of the coal so imported 90 per cent. came from England. A considerable amount of mining machinery, briquetting presses, etc., have been imported recently, mainly from the United States. The selling price has increased greatly, and now ranges from 40*s.* to 70*s.* per ton.

The chief deposits occur in Eubœa, Attica, and Peloponnesus, the 1917 output being divided between them, 101,000 tons, 36,000 tons, and 16,000 tons respectively. It is estimated that the present known deposits contain a total reserve of 30,000,000 tons. Some new deposits six miles north of Ekaterina in Greek Macedonia are now being developed. These deposits are of lacustrine origin, and yield a material of very good quality. Although the region has not yet been fully surveyed, the deposits so far proved are estimated at 700,000 tons. Railway connexions are being built, and an output of 200 tons per day is expected.—(*U.S. Com. Rep., Aug.* 7 and 19, 1918.)

Malaga Red Oxides.—The manufacture of red ferric oxide paint from hematite ores has greatly developed in the provinces of Jaen and Malaga during the war. The crude ore is ground, and preferably washed with water, the finest powder being collected and dried. The pigment is used for ship bottoms, and also as a colouring material for paper, rubber, tiles, etc. The higher grade Spanish oxides contain from 85 to 90 per cent. Fe_2O_3, but the colour does not depend directly on the ferric oxide content. The exports have increased considerably, 5655 tons being exported in 1916 and 6055 tons in 1917. Much crude ore is also exported from Malaga.—(*U.S. Com. Rep., July* 31, 1918.)

The Rational Utilisation of Coal.—In view of the demand in Germany for a more rational utilisation of coal, the Imperial Treasury Board called for expert reports on the subject, and these have recently appeared in pamphlet form under the above title. The authors, Prof. N. Caro, Dr. G. Klingenberg, F. Russig and Herr Lempelius all express themselves sceptical on the subject. Prof. Caro admits that the direct firing of coal is often technically uneconomical but refers to two important considerations which are often overlooked: (1) the gasification of coal requires a large consumption of energy, and (2) the heating of boilers with gas always absorbs more fuel than the direct heating with coal. Prof. Klingenberg points out that an unlimited increase in the production of nitrogen would by no means find a ready market with German agriculturalists, as the amount of nitrogen they can use is limited by the quantities of potash and phosphoric acid available, and it is precisely the production of soluble phosphate which is very restricted. The advocates of gasification contend that these reports are biassed as their authors are connected with competing interests, *e.g.*, Prof. Caro fears that cheap ammonia from coal would restrict the output of synthetic ammonia.—(*Iron and Coal Tr. Rev., Sept.* 27, 1918.)

Pulverised Coal.—Mr. L. C. Harvey has carried out for the Director of Fuel Research a full investigation into the progress recently made in the United States in the use of pulverised coal for metallurgical and general industrial purposes for steam raising and for railway uses. The information obtained will be issued as a report by the Department of Scientific and Industrial Research at an early date.

American Coke Ovens.—The preliminary Government estimate places the total coke production of America in 1917 at 56,000,000 tons, the largest in the history of the industry. Of this total, 34,000,000 tons, or 60 per cent., was beehive coke, and 22,000,000 tons, or 40 per cent., was by-product coke. The output of by-product coking plants is increasing at a far more rapid rate than that of the beehive plants. The by-product plants now under construction in the United States will have a capacity of 13,800,000 tons, and the majority of these plants will be in operation this year. The total capacity of the by-product coking ovens in the United States will then be about 40,600,000 tons annually. This is more than 5,000,000 tons above the maximum production of the beehive ovens reached in 1916, when all conditions were favourable for effecting the greatest possible production

from the beehive plants.—(*Engineering, Oct.* 11, 1918.)

Antimony in 1916.—The chief sources of the antimony used in the United States in 1916 were: (i) Ore imported from China (1048 short tons), Bolivia (4317 tons), Mexico (1339 tons), and about 1000 tons from other countries, chiefly Peru, Portugal and the Dutch East Indies. (ii) About 4500 tons of ore, containing 40 per cent. of antimony, mined in the western States, valued at £8000, and obtained chiefly from Nevada, California, Alaska, Washington, Oregon, Idaho and Arkansas. (iii) Smaller quantities of crude antimony (*i.e.*, crude antimony, needle antimony and antimony matte, which has been fused and cast into ingots) imported from China. (iv) Antimony regulus, or metal, chiefly imported from China (10,000 tons), and Spain (156 short tons), but also produced in small quantities in the United States, and (v) antimonial lead, which contains 12—18 per cent. of antimony.

Antimony mining in Bolivia has developed rapidly during the war, the production having risen from less than 300 tons in 1914 to 27,414 tons in 1916. Nearly the whole of this amount was exported to England. Similar, but smaller developments have also occurred in Peru and Mexico.

The exports from China in 1916 were 82,000 tons of antimony ore and 24,740 tons of fused antimony sulphide and metallic antimony.

The average price in New York in 1908—1914 for the highest grades of antimony was about 4*d.* per lb. Early in 1916 the price was 1*s.* 9*d.*, then 1*s.* 10*d.* afterwards declining steadily to 5½*d.* with a rise near the end of 1916 to 7½*d.* The severe decline was due to the Chinese having flooded the American market with their products, American producers being unable to compete.

The chief uses of antimony are: For producing the appearance of polished steel on "papier mâché" and pottery; in alloys such as type metal, Britannia metal and other "white" metals, and for acid-resisting valves; as tetroxide in rendering enamels opaque; as tri-oxide for colouring glass, as a paint, pigment and for medicinal purposes; as red sulphide in vulcanising rubber for pigments and for the striking surface on safety match boxes; lead antimoniate or Naples yellow is used as a pigment in paints, and in the glass and ceramic industries.

In wartime, the foregoing uses are largely overshadowed by the extensive use of antimony alloyed with lead in the manufacture of shrapnel bullets, and of pure antimony sulphide in shell primers and as a smoke producer.—(*U.S. Geol. Surv., July*, 1918.)

Arsenic, Bismuth, Selenium, and Tellurium in 1917.—In 1917 the United States produced 6151 short tons of arsenious oxide, valued at $1,118,313; nearly the whole output was recovered from smelter fume, chiefly at Butte (Mont.), Tintic (Utah), and Tacoma (Wash.). The demand at present exceeds the supply, due chiefly to the increased demand for insecticides. The balance is used in glass manufacture and for sheep dip. During 1917 the American Metals Co., Ltd., resumed production at Mapimi, Mexico, where arsenic forms a by-product in lead smelting. At Brinton (Va.) ore is now being mined and treated primarily for its arsenic content. Additional plant (Cottrell system) is in course of construction at Anaconda, and will be in operation in a few months' time. Imports of white arsenic and orpiment into the United States increased to 3955 short tons in 1917; the imports from Canada consisted of arsenious oxide obtained in the smelting of silver ores in the Cobalt district.

The demand for and production of bismuth were hardly greater than in 1916. The metal obtained in the United States is almost entirely a by-product from the refining of lead bullion; 40 short tons were imported in 1917; probably less than 250 tons annually is sufficient to meet the demand. The American output of selenium in 1917 was 39,630 lb., valued at $70,000, and was all derived from copper-refining sludge. In addition to its other uses, it is now employed as a substitute for manganese ore in the glass industry. Like selenium, tellurium is recovered in the refining of copper; the production is capable of large expansion, but the demand is strictly limited. The price averaged about $3 per lb. —(*U.S. Geol. Surv., June*, 1918.)

Cadmium in 1917.—The American production in 1917 was 207,408 lb. of metal and 50,169 lb. of sulphide. No cadmium is recovered in the United States in the distillation of zinc ores, most of the output being derived from baghouse dusts at lead smelters. The metal is also extracted from the residue left in making zinc chloride from low-grade zinc ores and from zinc ashes and drosses. Another source which may become important in view of the increasing number of electrolytic zinc plants is the precipitate obtained in purifying the electrolyte prior to deposition of the zinc, as well as the anode mud. Flue dust from brass works contains as much as 2·3 per cent. of cadmium. The metal has been used lately as a substitute for tin in solder; the supply can easily be increased to meet any reasonable demand.—(*U.S. Geol. Surv., June*, 1918.)

The Japanese Copper Industry.—The refining and manufacturing of copper is the most important native metal industry of Japan, the exportation amounting to about £10,000,000 worth per annum. Ingots and slabs are imported from Korea, waste copper coins from China, and submarine cables from Great Britain. About £9,000,000 worth of copper ingots and slabs are exported. Owing to war conditions exports have suffered and large stocks accumulated. The present price of copper in Japan is about £108 10*s.* per long ton.—(*U.S. Com. Rep., July* 31, 1918.)

Mexico's Mineral Production in 1917.—The mineral production of the Mexican States during 1917 was the following, in kilos. of 2·2 lb.:—*Gold*: 5,788,972, including 2,124,737 from Mexico and 1,855,707 from Hidalgo. *Silver*: 648,684,365, including 336,160,604 from Hidalgo. *Copper*: 141,528,966, including 83,348,000 from Sonora. *Lead*: 29,769,455, including 11,308,000 from Coahuila. *Zinc*: 3,888,124 from Zacatecas. *Antimony*: 2,140,590 from San Luis Potosi.—(*U.S. Com. Rep., July* 25, 1918.)

Development of Argentine Mica Industry.—The annual exportation of mica from Argentina is variable because the industry is not yet properly established. The amounts exported during the last few years have been (in lb.): 1912, 14,335; 1913, 14,178; 1914, 725; 1915, none; 1916, 14,033; 1917, 139,045, including 71,012 lb. to England, 52,470 lb. to the United States, 12,099 lb. to Italy, 2809 lb. to Spain. There will undoubtedly be a greater production in 1918.

The industrial possibilities of the mineral have not been specially studied; there is however an abundance, notably in the provinces of Cordoba, San Luis and San Juan. Owing to German cornering the prices of mica have risen 25 to 30 per cent. during the last six months. Iron has been found in recent samples of ore.—(*U.S. Com. Rep., Aug.* 14, 1918.)

The Pyrites Mines of Norway.—According to the *Frankfurter Zeitung*, the Storthing has approved, by eighty-three votes to thirty-one, the purchase of the greater part of the French shareholdings in the Grong Pyrites Mines in the Northern Department of Drontheim for ten and a half million kroner. The deposits of the Grong district are estimated at from sixteen to eighteen million tons of pyrites.

At the price of Kr.30 a ton, f.o.b., they have a total value of five hundred million kroner. It has not yet been decided if the State is to work these mines. Before beginning operations on a large scale, a line of railway will have to be built, which could not be completed before 1924. The whole capital will amount to eighty million kroner. A yearly output of 400,000 tons of pyrites is expected.—(*Metall u. Erz, July* 8, 1918.)

THE GERMAN POTASH INDUSTRY.—The German Potash Syndicate has forwarded a report to the Legislature, in which a somewhat pessimistic view is taken of the future of this industry. The report states that a great deal is being said and written about the world monopoly of the German potash industry and of the inferior harvest in hostile countries due to the shortage of mineral manures. This has given rise to the belief that the industry will become extremely prosperous as soon as the war ends. The industry itself is quite aware that there are not any deposits of material importance in other countries, but the experts are of opinion that all conditions for an export trade of any great magnitude will be wanting after the war, namely, a sufficient number of adequate installations at the mines with adequate labour, coal and stocks. In consequence the German potash industry will not be able to satisfy the anticipated demand from abroad during the first few years after conclusion of peace, even if the requisite tonnage were available, which is very questionable. Consequently any large profits cannot be reckoned upon immediately after the cessation of hostilities, and should such profits materialise later on a large portion of them will be required for bringing the works up to the required capacity.—(*Engineering, Oct.* 11, 1918.)

DUTCH SALT DEPOSITS.—A new company, called the Royal Netherlands Salt Industry, has been formed to work the salt deposits which occur in Gelderland and Overyssel. The Government is encouraging the scheme, and has subscribed one-fifth of the total capital, which is £60,000. The deposits are estimated to be over 60 ft. in thickness and to extend over a considerable area, and it is calculated that there is a possible total reserve of over 1000 million tons. The total annual home consumption is about 170,000 tons. Operations are to commence almost immediately.—(*U.S. Com. Rep., Aug.* 7, 1918.)

NEW ZEALAND COAL OUTPUT.—According to figures furnished by the Minister of Munitions for New Zealand, the output of coal from all the New Zealand mines in 1917 was 2,068,419 tons, or nearly 200,000 tons less than for 1916. Imports of coal in 1916 were 293,956 tons, and for 1917, 291,591 tons, but the latter figures include a considerable quantity of coal belonging to the Admiralty, made available at the time to meet local scarcity. New Zealand's annual requirements of coal are estimated at 1,200,000 tons.—(*Coll. Guard., Oct.* 18, 1918.)

DRIED MILK PRODUCTION IN NEW ZEALAND.—The production of dried milk in New Zealand promises to be much more profitable than butter or cheese making; and 3*s.* to 3*s.* 6*d.* per lb. may be realised for butter-fat, which is about double the price for the last two or three years. Representatives have been sent from south of Auckland to the United States to study conditions and arrange for machinery.—(*U.S. Com. Rep., July* 31, 1918.)

COTTONSEED PRODUCTS IN THE U.S.A.—The amount of cottonseed received at mills from August 1, 1917, to July 31, 1918, was 4,260,273 tons, and the quantity crushed was 4,257,825 tons. Imports of cottonseed oil for the same period amounted to 16,967,737 lb.; and exports of cottonseed products: Oil, 108,663,042 lb.; cake meal, 19,051 tons and 187,704 bales.—(*Oil, Paint and Drug Rep., Aug.* 26, 1918.)

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

Petroleum (Production) Bill.

In moving that the House resolve itself into Committee upon this Bill, Lord Elphinstone defended the Ministry of Munitions against the charges brought against it by the Duke of Northumberland. In reply, the latter repeated his allegations:—(1) The Government is establishing a monopoly for a private firm; (2) the Government has deliberately delayed the production of petroleum by nine months; and (3) the action adopted and the policy pursued by the Government amount to a breach of faith. He further demanded a rigorous inquiry into the action and policy of the Petroleum Executive, the body which actually devised the agreement with Messrs. Pearson. Viscount Cowdray said that under the agreement his firm was to give all the knowledge it possesses without any pecuniary remuneration: there was no question of a monopoly, for the firm was merely an agent for the Government. There is no doubt that oil will be produced, and the only uncertainty is as to the quantity.

After a motion to adjourn the debate had been negatived, the Bill was considered in Committee.

HOUSE OF COMMONS.

Hops.

Mr. Prothero presented a detailed statistical statement in regard to the importation of hops during the years 1907—1914 and the annual production in this country during the same period.—(Oct. 23.)

Exportation of Salt.

Mr. L. Scott asked if the President of the Board of Trade was aware that the Scandinavian countries are important markets for British salt, that German competition there was always very keen, and that Germany has just sold to Norway, free from all restrictions, 60,000 tons of salt with the direct object of making a post-war market, and whether he would remove or substantially relax the present veto on the export of salt from the United Kingdom. In reply, Sir A. Stanley said he was fully aware of the importance of preserving our overseas market so far as possible. The imports of German salt into Norway have greatly increased during the war, and a large quantity is now being sold free from any condition as to its use or destination.—(Oct. 24.)

Sir A. Stanley, in reply to Col. Thorne, said that the total exports of salt from January to September this year were 207,000 tons. Norway took 41,000, Nigeria 29,000, Canada 20,000, U.S.A. 15,000, and India 14,000; the remainder was very widely distributed. The average price per ton of salt exported from this country was 18*s.* 6*d.* in 1914, 21*s.* in 1915, 29*s.* in 1916, and 42*s.* 6*d.* in 1917.—(Oct. 31.)

Life of Patents.

Mr. Jowett asked if there could be an extension of the period of protection for patents belonging to men who on account of military service had been unable to develop them. Sir A. Stanley, in reply, quoted Rule 3 of the Patents, Designs and Trade Marks (Temporary) Rules, 1914, by which the Comptroller-General of Patents is empowered to grant extension in such cases. Under this rule the Comptroller gives every consideration to patentees on active service, and to those who, in consequence of such service, have failed to pay their renewal fees within the prescribed time.—(Oct. 24.)

Potash Production.

Mr. Kellaway, answering Mr. Wright, said that a scheme for recovering potash on a commercial scale from blast-furnace flue dust was approved last year, and in consequence the Ministry has encouraged the installation of gas-cleaning plant at various ironworks. Certain of these plants are now in operation, others are under erection, while others, again, are in course of construction. A factory has also been erected at which pure muriate of potash is being manufactured from such dust. This factory is capable of dealing with all the dust that can be collected by the gas-cleaning plants now in operation or under construction. As further gas-cleaning plants are installed it is proposed to erect additional factories in suitable localities. A small amount of potash is also being obtained as a by-product of the cement industry, and experiments are now being carried on with a view to increase greatly the amount so recovered.—(Oct. 24.)

Water Power in India.

Colonel Yate asked the Secretary of State for India if he had received the Report of the Committee constituted by the Government of India to inquire into the water-power resources of that country, and what steps had been taken in the matter. Mr. Montague replied that the Government of India had decided, before constituting a committee, to arrange for a report to be made by an engineer, who will be assisted by an electrical expert. At the same time information will be collected regarding industrial possibilities.—(Oct. 28.)

British Metals Corporation.

In reply to Mr. A. Strauss, Sir A. Stanley said that H.M. Government welcomed the formation of a strong British organisation aiming at securing for British interests the predominance in the non-ferrous metal trades of the British Empire hitherto held by Germany. But there has been no promise, nor is there any intention to accord to the British Metal Corporation any preferential treatment as compared with any other British-controlled companies having similar objects.—(Oct. 28.)

Petroleum Production.

In answer to thirteen questions on the subject of the agreement between the Ministry of Munitions and Messrs. Pearson and Sons, Ltd., in respect of boring for oil in Great Britain, Mr. Kellaway said that the principle of the policy embodied in the agreement with Messrs. Pearson was approved by the Government in March last. No licences under the Defence of the Realm Act are yet in force, and no date for the submission of applications for licences has been fixed, nor is it intended that any shall be fixed.

Particulars of fifteen areas in the United Kingdom suitable for petroleum boring have been handed confidentially to the Secretary of State for the Colonies. The agreement provides that the divulgence of particulars cannot be considered until the passing of legislation necessary to protect the fields against indiscriminate drilling. Following the rejection of royalties by the House an undertaking was given that no licence would be permitted which allowed the payment of a royalty. Subject to this provision, and to geological evidence being satisfactory to the Committee on Geology, and to the area selected not being one already appropriated or licensed by the Government, any landowner can be granted a licence to bore on his own land or can lease his land for that purpose.

Messrs. Pearson are acting as managers for the Government, and any petroleum produce will be at the disposal of the Government. The function of approving the first fifteen drilling areas was assigned to Sir J. Cadman, the Director of the Petroleum Executive, and to the Geological Advisory Committee of that Department. Messrs. Pearson as managers for the Government have no monopoly rights, and the machinery and appliances are the property of the Government. The arrangements which the petroleum managers, acting on behalf of the Government, may make for refining crude oil are under consideration, but have not yet been decided. No change of agents can be made without the consent of the Government.—(Oct. 31.)

LEGAL INTELLIGENCE.

SOAP CONTRACT DISPUTE. *Zeyen and Co. v. Lindley, Duffield and Co.*

Before Mr. Justice Sankey in the King's Bench Division on October 28 and 31, the plaintiff company claimed damages in respect of a contract for the sale of 1000 tons of soap. According to a document, the soap should have contained 64 per cent. of fatty acids, and actually it contained 11 per cent. and 84—88 per cent. of water; and on this account Messrs. Zeyen and Co. had had to pay £1750 damages on a re-sale of some of it, and another similar legal action was pending. As only 70 tons of soap had been delivered, there was a further claim for £2325, representing the profit which would have been realised on the sale of 930 tons if it had been of the quality specified. Counsel for the plaintiff company said that the defendant company denied warranty, pleaded that the soap delivered was as good as a 64 per cent. soap, and that by a clause in the contract referring to shortage of raw material and Government interference there was no obligation to deliver the 930 tons; further, it claimed compensation on the ground that plaintiff company had agreed to take a different soap at a different price.

His Lordship gave judgment for the plaintiff company, with costs. He awarded £2190 in damages for the breach of warranty, and £650 in respect of the undelivered balance of the order.

SODIUM SILICATE CONTRACT DISPUTE. *R. A. L. Kirk v. The British and French Chemical Manufacturing Co., Ltd., and R. Martens and Co., Ltd.*

This action was one for breach of contract, or alternatively, for breach of warranty of authority on the part of the second-named defendant. Messrs. Martens pleaded that they had entered into the contract for the sale of sodium silicate on behalf of the Chemical Co., but the latter repudiated the contract and denied the authority. No deliveries had been made.

On the second day of the hearing (Nov. 1) it was announced that a settlement, the terms of which were not mentioned, had been arrived at, to which Mr. Justice McCardie assented.

CREAM OF TARTAR CONTRACT CASE. *Fuerst Bros., Ltd., v. Fabbrica Chimica Ovenella.*

This case which resulted, on an appeal, in favour of Messrs. Fuerst Bros. (this J., 1918, 284 R) came before Mr. Pollock, Official Referee, at the High Court, on October 31, for the assessment of damages.

There was no defence, and the Referee assessed the damages at the amount claimed, *viz.*, £1815, with costs.

CANCELLATION OF PRE-WAR ENEMY CONTRACTS.—In the King's Bench Division on November 4, Mr. Justice Bray granted declarations to Messrs. D. T. Boyd and A. Pratt, dissolving two contracts made with the Kunstdüngerfabrik in Schlan (Austria), early in 1914, for the sale by them of 2500 tons of dried Florida rock phosphate.

[Fuller reports of the above cases may be inspected at the Society's offices (Editorial Dept.).]

GOVERNMENT ORDERS AND NOTICES.

MAXIMUM PRICES OF SULPHURIC ACID.

An Order will shortly be issued by the Minister of Munitions fixing, as from November 1, new maximum prices for sulphuric acid in place of those fixed by an Order dated May 10, 1918. The new prices will be as follows:—

Schedule.

1. Weak acid, *i.e.*, acid of all strengths up to and including 90 per cent. H_2SO_4.

—	Maximum Price per Ton	Remarks
Class A.—Arsenical acid	88*s.*	For acid of 140° Tw. at 60° F., with an increase or reduction of 6*d.* in respect of each complete degree Twaddell by which the specific gravity is more or less than 140° Tw. at 60° F.
Class B.—Non-arsenical or de-arsenicated acid	105*s.*	For acid of 140° Tw. at 60° F., with an increase or reduction of 7*d.* in respect of each complete degree Twaddell by which the specific gravity is more or less than 140° Tw. at 60° F.

2. Concentrated acid, *i.e.*, acid of all strengths over 90 per cent. H_2SO_4.

Monohydrate (H_2SO_4) Content of Acid	Maximum Price per Ton					
	Class C. Arsenical Acid			Class D. De-arsenicated or Non-arsenical Acid		
	£	*s.*	*d.*	£	*s.*	*d.*
Over 90 per cent. and up to 91 per cent.	5	19	6	7	5	3
,, 91 ,, ,, ,, 92 ,,	6	6	0	7	12	3
,, 92 ,, ,, ,, 93 ,,	6	12	6	7	19	3
,, 93 ,, ,, ,, 93½ ,,	6	19	0	8	6	3
,, 93½ ,, ,, ,, 94 ,,	7	2	3	8	9	9
,, 94 ,, ,, ,, 94½ ,,	7	5	6	8	13	3
,, 94½ ,, ,, ,, 95 ,,	7	8	9	8	16	9
,, 95 ,, ,, ,, 95½ ,,	7	13	9	9	2	0
,, 95½ ,, ,, ,, 96 ,,	7	18	9	9	7	6

Over 96 per cent. in both classes, an addition of 1*s.* 2*d.* per ton for each complete one-tenth of 1 per cent. of additional monohydrate.

Certain additional charges are authorised for package, filling, and, in certain circumstances, carriage.

All communications in reference to the new Order should be made to the Director of Acid Supplies, Ministry of Munitions, Department of Explosives Supply, Storey's Gate, Westminster, S.W. 1.

REPORTS.

REPORT ON THE TRADE OF AUSTRALIA FOR 1917. *By* G. T. MILNE, *H.M. Trade Commissioner in the Commonwealth of Australia.* [*Cd.* 9160, 3*d.*] London: H.M. Stationery Office.

Although trade vicissitudes due to the war were accentuated during 1917, the Commonwealth has experienced for the third season in succession favourable weather for the growing of her principal crops. This circumstance largely accounts for the very favourable balance of trade (over £19,000,000).

Australia produces both cane and beet sugar, but the latter industry has never been an unqualified success. During the 1916-17 season, 1,579,514 tons of cane were harvested, yielding 176,973 tons of raw sugar, and the production would have been much greater but for floods. Nearly one-sixth of the total output was from mills under Government control. The State beet sugar factory at Maffra produced 1948 tons of white sugar from 15,149 tons of beet raised from 320 acres. This quantity of sugar is less than one-half the capacity of the factory. Owing to the difficulty of obtaining seed, there may be a decrease in the area under crop next season.

Industrial troubles were unusually prominent, 444 strikes having occurred, affecting 173,970 workpeople. The resulting restrictions in the use of coal and power reacted seriously on industrial establishments.

The following table shows the values of certain competitive merchandise imported into Australia in the years 1913 and 1916-17.

——	1913	1916–17
	£	£
Earthenware, Cement, China, Glass	1,580,615	1,112,987
Ammunition and Explosives	755,246	625,138
Chemicals—Pharmaceutical	775,131	1,229,722
,, Industrial	608,273	827,241
,, Fertilisers	142,277	1,452
Paints and Varnishes	609,859	666,792
Oils, Fats and Waxes	416,830	257,321

Increases in value in the above table are often accompanied by decreases in quantity. For example, the imports of paints "prepared for use" in 1913 amounted to 223,580 cwt., valued at £346,844. The imports for 1916-17, valued at £362,941, amounted to 142,447 cwt. The United Kingdom formerly had by far the largest share in this trade and still holds the preponderant position, but the share of the United States is increasing. In the smaller but relatively important trade in dry colours, in which Germany had an appreciable share, the decline in the imports has not been so marked, and the United Kingdom continues to be the chief source of supply. In both paints and varnishes the local factories have not produced nearly sufficient to meet local demands.

Foreign trade with Japan has been growing, and among the increased importations from this source are glassware, carbide, matches, paper and sulphur. It is pointed out, however, that complaints have been numerous as to the unsatisfactory character of many Japanese goods, and of Japanese conditions of trading generally. Importers express readiness to revert to trading with the United Kingdom after the war, but too much reliance should not be placed on expressions of this kind, as the Japanese are well informed of the adverse criticism and are endeavouring to meet it.

Considerable developments are taking place in the steel industry of New South Wales. The products include ferro-silicon and chrome steel. A factory near Sydney is producing linseed oil, the capacity of the plant being equivalent to about two-thirds of the Australian requirements. Experiments are proceeding with success in North Queensland for the manufacture of paper from "lalang" or blady grass, and wood pulp is produced from local timbers (hoop pine and bunya bunya). Oil is being distilled from shale in New South Wales, 3,000,000 gallons being produced between March, 1915, and July, 1917. The Electrolytic Zinc Company in Tasmania is turning out a high grade electrolytic zinc, and other electrolytic plants are being erected.

The development of hydro-electric power has been

attracting increased attention, and a very important extension of the inland transport system was realised in the completion of the trans-continental railway joining Port Augusta in South Australia to Kalgoorlie in Western Australia. This line took five years to construct and cost about 7 millions sterling.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal, October* 24 *and* 31.)

OPENINGS FOR BRITISH TRADE.

Firms at Bombay wish to get into touch with U.K. manufacturers of iron and steel products, machinery, metals, paper, etc. [Ref. Nos. 324, 335.]

Agents at Montreal desire to represent U.K. manufacturers of heavy chemicals, levigated colours, chemical apparatus, etc. [Ref. Nos. 326, 339.]

A firm at Vancouver desires agencies for U.K. manufacturers of druggists' sundries, dyes, glue, etc. [Ref. No. 338.]

A firm at Cape Town wishes to represent U.K. manufacturers of steel products, galvanised ware, disinfectants, etc. [Ref. No. 332.]

Inquiries respecting the following notices should be addressed to The Secretary, British Chamber of Commerce for Italy, 7 Via Carlo Felice, Genoa :—

Firms at Genoa desire agencies for U.K. manufacturers of chemicals, oilseeds, foodstuffs, soap, and soap-making materials, etc. [1542, 1546, 1548.]

A firm at Renate, Brianza, desires to purchase supplies of galalith. [1560.]

TARIFF. CUSTOMS. EXCISE.

Bermuda.—The import and export of food, fertilisers, soaps, kerosene, and coal are prohibited except under licence, as from September 2.

British India.—The *Board of Trade J.* for October 24 gives a list of the preparations containing cocaine or other derivatives of the coca plant to be exempted from excise or customs restrictions, as from August 19, under certain conditions.

The export of paper-making materials is prohibited to all destinations, as from August 17.

Canada.—The *Board of Trade J.* for October 31 gives a list of restricted imports covered by Memorandum 2238 B, dated September 14. The list is a long one, and includes all acids, ammonia, aloxite, argols, asbestos, asphalt, balata, bones and horn, borax, caffeine, candle pitch and vegetable stearin, cement, chloride of lime, all coal-tar distillates, corundum, cryolite, emery, explosives, fullers' earth, fusel oil, glue, glass, graphite, gypsum, kapoc, leather, lime, many metals, their ores and derivatives, manure salts, mica, oils, oilseeds, oilcloth, paints, paper, paraffin, rubber, etc.

Denmark.—The export of metal dust, machinery, and parts of machines is prohibited.

France.—Marble and oilcloth may be exported or re-exported to the U.K., Belgium (uninvaded territory), Italy, or extra-European country without special authorisation.

The *Bd. of Trade J.* for October 24 gives a copy of the Bankers' Copy of French Import Licences, and calls attention to the procedure which has been arranged to enable exporters in this country to obtain with the minimum amount of trouble documentary evidence that the importation of the goods has been duly licensed.

The issue of October 31 also gives a list of goods the export and re-export of which are prohibited except under licence, as from October 20. The list includes emery, lime, rails of iron or steel, lead, fireproof pottery, many machines, nails, etc.

Grenada.—The import duties on beers, spirits, and wines have been increased, as from September 16.

Japan.—The *Bd. of Trade J.* for October 31 gives a list of the revised tariff classification of certain articles which came into force on November 1. The list includes cinnamon extract, filtering plates, etc.

The export of gold and silver wares is prohibited except under licence.

Netherlands.—The export of pipe clay, brick clay, china clay, etc., is prohibited, as from October 18.

New Zealand.—The *Bd. of Trade J.* for October 24 gives a list of decisions as to the classification of certain articles under the customs tariff. Among the articles affected are sulphonated oils, soluble prussian blue, and mica.

TRADE NOTES.

American Chemical Trade during the War.—The *Journal of Industrial and Engineering Chemistry* (Sept., 1918) contains an important article upon the effects of the war on the foreign trade of the United States during the fiscal period June 30, 1914—1918. The statistical information, derived from official sources, is very full, and from it the summary table given below is taken. The classification adopted is necessarily arbitrary, *e.g.*, under "Fertilisers" are included only materials exclusively used for that purpose, hence all sodium nitrate is classed under "Chemicals." The heading "Miscellaneous Products" includes sugar, paper, wood pulp, photographic goods, etc., and under "Miscellaneous Materials" are to be found gelatin, bones, vanilla beans, etc.

Summary of Foreign Trade in Chemicals and Allied Products.

	Imports 1914 Million Dollars	Imports 1918 Million Dollars	Exports 1914 Million Dollars	Exports 1918 Million Dollars
Chemicals	61	97	15	129
Drugs, medicines, etc.	9	11	11	21
Dyes, dyestuffs, dyewoods...	10	9	(*a*)	17
Explosives	1	8	6	379
Fertilisers	28	5	12	6
Gums, resins, etc. ...	88	227	20	11
Metals, ores, earths ...	132	286	175	327
Oils, fats, waxes ...	79	200	194	378
Paints, pigments, etc.	2	1	7	17
Tanning materials ...	5	7	1	4
Paper and pulp ...	30	66	6	30
Miscellaneous products	120	253	44	132
Miscellaneous materials	8	6	2	3
Total	573	1,176	493	1,454

(*a*) $400,000

Spain in 1917.—*Malaga (including Granada and Jaen)*.—This is essentially a mining and agricultural district, the principal products of chemical interest being olive oil, essential oils, sugar, pig lead and iron products. It is difficult to estimate the total amount of merchandise imported, since much comes overland, but the imports by sea included 19,826 metric tons of coal (as against the pre-war figure of 101,479 tons), 6533 metric tons of fertilisers, 18,260 tons of phosphate of lime, and 114 tons of petroleum and mineral oils.

Malaga has become the most important olive-oil port in the world, exporting 4,743,000 gallons in

1917. The 1916-1917 yield of oil was very good, 49,221 tons being pressed from 280,090 tons of olives. The largest quantity was this year sent direct to the U.S.A., instead of being forwarded to Italy or France for preliminary blending. There are three olive oil refineries in Malaga, with a daily capacity of 80 tons of oil, as well as three sulphur oil factories.

The crop of citrus fruits has been good, but owing to the difficulties of transport much of the fruit has been left on the trees or sold to the two small citric acid factories at Pizara.

The district produces both cane and beet sugar, yielding 92% of the total Spanish yield of cane sugar of 4264 tons, and 28% of the total beet sugar which amounted to 111,541 tons. The essential oil industry has progressed considerably since the war, the varieties including oils of thyme, rosemary, lavender, origanum, spike, etc.

The mining industry has had a very successful year, the exports including 8482 tons of iron ore, 54,111 tons of lead, and 4997 tons of manufactured iron and steel. The iron ore is principally the red oxide used for paint-making.

Almeria.—This province is mainly agricultural. During 1917 it produced 2525 tons of almonds, 4100 tons of olives, and 16,000 tons of sugar cane. It is also a large exporter of esparto grass, shipping over 13 million kilos. to Great Britain in 1917.

Huelva.—The foreign trade of this district in 1917 was very unsatisfactory, mainly owing to lack of transport. The export of minerals showed a decrease of 557,490 tons over 1917, the total production being 1,996,071 tons. The exports of copper ingots and manganese ore increased during the year. The principal mineral exports were:—Copper ingots, 21,728 tons; copper ore, 363,082 tons; copper precipitate, 10,007 tons; carbonate of manganese, 21,147 tons; and sulphur ore, 1,580,107 tons. The imports included 554 tons of cement, 60 tons of chemical products, 185,443 tons of coal, and 13,834 tons of pig iron.—(*U.S. Com. Rep., July* 1, 1918.)

COMPANY NEWS.

THE UNITED INDIGO AND CHEMICAL CO., LTD.

At the annual meeting held in Manchester on October 28, Mr. G. Haywood, chairman, said that the scope of the business had been enlarged and that other interests besides the cotton and wool industries were being supplied. He denied the rumour that the company intended to amalgamate with another chemical undertaking. The accounts for the year ended June 30 show a record net profit of £52,399, after deducting £28,000 and £4000 for British and American excess profits duty, respectively. The issued capital stands at £95,000. The sum of £29,054 is carried forward, against £26,575 brought in, and dividends of 20 per cent. on the preference and ordinary shares have been declared and paid.

ODAMS' NITRO-PHOSPHATE AND CHEMICAL CO., LTD.

The sixty-sixth ordinary general meeting was held on October 30 in London. Mr. C. W. Tindall, chairman, said the last year's trading had been very good and the financial position was excellent. The managing director, in referring to the pre-war foreign competition in superphosphate, said that the damage was really caused by the surplus acid which was made from the concentrates sent to Belgium. The position was now changed, and the smelting was to be done at the State-aided works near Bristol. He understood that these works would have a capacity of 200,000 tons of superphosphate per annum. He wondered what the position of the company would be when the Government sulphuric acid plants were turned over to the manufacture of superphosphate. The marketing of such a huge production would inevitably lower the price and lead to a reduction in wages.

REVIEWS.

Coal and its Scientific Uses. *By* W. A. Bone. *Monographs on Industrial Chemistry, edited by* Sir Ed. Thorpe. *Pp.* xv.+491. (*London: Longmans, Green and Co.* 1918.) *Price* 21*s. net.*

Despite the enormous importance of coal as probably the most vital factor in modern industry, the available scientific literature of the subject is not nearly so extensive as it should be. For this reason, students of fuel technology will welcome a monograph on the subject by an authority of the status of Prof. Bone. In this work the author has reviewed in a most masterly manner the extensive field covered by the title, and the result can be regarded as a notable addition to the modern literature on the subject.

After an introductory chapter dealing with the general aspects of the coal question, the author has devoted the first portion of the work to a critical review of the modern scientific conceptions of coal, its origin and formation, its classification, and its chemical constitution. Three chapters are given to such subjects as the origin and formation of coal, the impurities in coal and the ultimate analysis and calorific values of coal.

In view of the importance of the question in connexion with coke-oven installations, the scientific principles of coal washing could perhaps have been more fully elaborated—a remark which applies also to the very brief mention made of the difference between the gross and net calorific values of coal. Most chemists dealing with coal questions will agree with the author in his criticism of the American method of determining the volatile matter, but it has always been recognised that this method, at the best, was only comparative, and its almost universal adoption by chemists had the advantage of standardising results to a certain extent. The author suggests an alternative method which perhaps offers some advantages, but is as equally open to criticism as the American method, and may possibly lead to confusion if the results obtained are not definitely ascribed to this method as against the customary one.

After dealing with the classification of coal, the author devotes five chapters to the constitution of coal and the action of solvents, to low temperature carbonisation, high temperature carbonisation, the oxidation of coal at low temperatures, and to its combustion and heat transmission in boilers.

Dealing as he is with a subject bristling with difficulties the author's treatment of this section can only be described as masterly. Results obtained by various observers are in many respects so contradictory that a clear conception of the various phenomena observed is very difficult to obtain, but the author has not only succeeded in steering clear of the many pitfalls, but has succeeded in collecting together the chaotic mass of material available, and in presenting a lucid description of the present state of knowledge on the subject. His outline of the problems that await solution serves to emphasise the enormous field for research that still remains to be explored.

No account is given, unfortunately, of the work done in the microscopic study of coal, and it is to

be hoped, in view of the light this throws on the purely chemical aspects, that Prof. Bone will see fit to include some notes on this subject in a later edition.

The latter portion of the book is devoted to a very valuable description of the industrial uses of coal. The principles of combustion and of heat transmission in boilers, are treated in two chapters, followed by an excellent review of the closely related problems of domestic heating and smoke abatement. After dealing with the theoretical considerations relating to the use of gaseous fuels the author proceeds to discuss the carbonisation industries and afterwards the manufacture of producer gas and water gas. These two chapters are particularly well done.

In two most interesting chapters, the author reviews in a very able manner a subject that is but rarely treated in books on coal—that of fuel economy in the manufacture of iron and steel. These chapters should be helpful to chemists and others engaged in this industry. A brief discussion follows on power production from coal, and the book closes with a chapter on surface combustion, made up principally of the author's lecture in 1914 to the Royal Institution with some additional remarks dealing with the more recent developments.

The book is delightfully written, and in every page the author shows his absolute grip of the subject. There are omissions, there are a few, a very few points that are controversial; but in a subject of this character these are unavoidable, and the work on the whole can only be described as an inspiring one, a book not only to be read, but to be re-read by all who are interested in the many-sided question of coal utilisation and conservation.

EDGAR C. EVANS.

INGOTS AND INGOT MOULDS. *By* A. W. *and* H. BREARLEY. *Pp.* xv + 218. (*London: Longmans, Green and Co.* 1918.) *Price* 16*s. net.*

The production of sound ingots has received a large amount of attention in recent years, and the Messrs. Brearley have done excellent service in making available to those interested this account of their study of ingots and ingot moulds. One of the objects of the book is to commend the use of stearin or other similar low melting-point substance for teaching purposes and to show how it may be applied to the elucidation of many of the problems relating to ingots and ingot moulds. The authors have been eminently successful in attaining their object, and have shown that the formation of pipe and secondary shrinkage cavities, the influence exerted on these by the shape and dimensions of the moulds, the advantages or otherwise of feeder heads, the influence of casting temperature on the soundness and strength of the ingots and the location and effects of segregation may be studied at little expense and with perfect safety. In spite of the differences which exist in the physical properties of steel and wax, the authors have shown quite clearly many similarities in the behaviour of the two materials when cast from the molten state.

In the study of blow-holes, it has been found possible to reproduce most of the types of these imperfections found in ingots, by saturating the molten stearin with sulphur dioxide or with a mixture of acetylene and coal gas before use.

Throughout the book there is evidence of the authors' wide experience and careful observation in steel ingot making, and they have fortunately been in a position to carry out large-scale experiments necessarily involving the scrapping of many tons of steel during their investigations. The book contains a large amount of useful information which is extremely difficult to obtain elsewhere, and although especially written for those interested in ingots or engaged in making them, it should appeal strongly to all interested in the metallurgy of steel. Much information of practical importance is given in the chapter dealing with the care of moulds, the taper of moulds, etc.

The whole subject is dealt with in a lucid manner, and the complex conditions obtaining during the pouring, solidification, and cooling of steel ingots are clearly interpreted. The book is illustrated by upwards of 100 excellent illustrations.

C. O. BANNISTER.

TRATTATO DI CHIMICA GENERALE ED APPLICATA ALL' INDUSTRIA. *By* E. MOLINARI. *Vol. I. Chimica Inorganica. Part I. Fourth Edition. Pp.* 560. (*Milan: U. Hoepli,* 1918.) *Price* 12.50 *lire.*

This edition of Molinari's well-known work contains descriptions of many new manufacturing processes, and the statistics of the production of the various chemicals have been brought up to date. The value of the book as a work of reference for the industrial chemist has also been increased by the attention which has been given to processes protected by German patents.

The Empire's Mineral Resources.—The Imperial Institute, in continuation of its publications with reference to the mineral resources of the Empire, has now issued a map with diagrams indicating the sources within the Empire of the chief metals of commercial importance. The outline map shows the occurrence in each British country of important metallic ores, and also the existence of deposits at present unworked. The diagrams attached to the map give for 1915 the production of each country, as well as the total British output and the world's output of each important metal or ore. The map, which is folded and mounted on linen, has been prepared with the advice of the Mineral Resources Committee of the Imperial Institute, and has been placed on sale at a price of 5*s.* 6*d.* post free.

PUBLICATIONS RECEIVED.

PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY. DEPARTMENT OF THE INTERIOR. (*Washington: Government Printing Office.* 1918.)

- CHROMITE IN 1917. *By* J. S. DILLER.
- SALT, BROMINE, AND CALCIUM CHLORIDE IN 1917. *By* R. W. STONE.
- ABRASIVE MATERIALS IN 1917. *By* F. J. KATZ.
- SILICA IN 1917. *By* F. J. KATZ.
- ASBESTOS IN 1917. *By* J. S. DILLER.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.* [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Inducheni, Finsquare, London.*]

THE GREAT WAR.

Since we last went to press, an event has happened of which the importance extends far beyond the confines of chemical industry. With the conclusion of the armistice between the Allied Powers and Germany on November 11, there came to an almost certain end the great war which has been raging for over four years, a war which has entailed the sacrifice of millions of human lives, the loss of incalculable wealth, and of which the moral no less than the material effects will persist for many years to come.

At such a time it is not only an imperative duty but a heartfelt pleasure to give expression to the thankfulness which all must feel for the decisive victory gained by the Allied Powers, an achievement which we owe in the first place to those who have offered their lives, and in the second to those who have served the national interest at home, and not least to those who, with determination and ability, have controlled the helm of State. With the political aspects of the war we are not here concerned, but from the ethical standpoint we can rejoice that our sense of justice, the greatest and most fundamental of virtues, has been vindicated, and that the civilised world has been freed from the bondage threatened by a domineering and heartless autocracy. The debt we owe to those who have perished can never be repaid; the most we can do is to secure a firmer footing for those who succeed them.

THE SYNTHETIC ORGANIC CHEMICAL INDUSTRY.*

FRANCIS H. CARR.

Chemists have long been aware of the extraordinary degree to which national life is dependent on their work, though many have become, during the past four years, more forcibly confirmed in this belief. At the same time, we have lost some of that modesty which hitherto has deterred us from making serious effort to convince the general public of the importance of chemistry. During the war invaluable propagandist work has been done for the chemist by the public recognition of the great services rendered by him in the production of munitions of war, and in addition the public has become enlightened as to the value of chemistry in our daily life. This enlightenment might not have been brought about but for the fact that a shortage of commodities directed public attention to their source, and so disclosed the immense powers which the chemist exercises over productivity in general, and the fact that insufficient use was being made of chemistry in this country.

The greater complexity which has come upon life during the past half century has caused us to become ever more dependent upon the achievements of applied chemistry; thus we find that many comparatively new productions, such as margarine, saccharin and aspirin, have become practical necessities. Had we the data to draw a graph of our dependence on applied science, the curve would be found to bend sharply upwards. If we have become dependent upon science at this accelerating rate in the past fifty years, how much more so shall we become during the next fifty? Even though the imagination fails to give us a clear vision of the future, surely it cannot fail to carry conviction as to the increasing importance of science, and most especially of *applied* chemistry, to the life of a great nation.

Now I wish to draw special attention to the applications of synthetic organic chemistry, for it was in this section that we were most appallingly behind when the war broke out; yet surely it has possibilities for the future even more wonderful than those of any other department of chemistry. We had become particularly dependent at the outbreak of war upon foreign supplies of synthetic dyes, drugs, photographic chemicals, perfumes, and flavouring agents. When this need was disclosed, British chemists successfully stepped into the breach.

Had the war broken out a decade later the result might have been disastrously different, so quickly were we falling behind in the race. The more intricate applications of science cannot be made suddenly; they require men with an intimate knowledge of detail which can only be slowly acquired. Moreover, the danger thus menacing us would not have been restricted to industrial disorganisation and distress. We must recognise that in future it may not even be necessary for a nation to resort to the use of arms in order to impose its will on other countries who have neglected to develop this vital power.

Let us glance for a moment at the nature of the progress which organic chemistry is making. There is every reason to believe that a knowledge of the chemical changes on which life processes are dependent is about to be unravelled. The work of such men as Ehrlich, Hopkins, Fletcher, Bayliss, Dale and Hofmeister on the metabolism of living cells and the chemistry of the blood is both remarkable and remarkably unsatisfying, but it points out clearly and unmistakably the trend of modern discovery and the vast possibilities of chemical science. Already, through the work of Fletcher and others, great progress has been made in the synthetic production of complex amino acids intimately related with animal and vegetable proteins. Amino acids such as alanine, histidine and tryptophane link up with each other thus: CO.OH H.NH, forming polypeptide chains. In quite recent years the work of Funk and others has revealed the fact that certain organic compounds are absolutely indispensable to life and growth. Hormones have been discovered which act powerfully in very minute quantities in physiological processes. One of these vitally necessary substances, adrenalin, is now produced artificially. Another is the more recently discovered thyroxin, the principle contained in the thyroid gland, which regulates the rate of body metabolism; this principle, now stated to be an oxyindol derivative of iodocyclohexane, is so active that 0·3 mg. raises the body metabolism 1 per cent. This amino acid, like adrenalin, is essential for the normal functions of the body. Other simple amino acids, such as tryptophane, have been found to be of great importance to life.

The powers of healing resulting from the study of the chemistry of these substances are just beginning to be realised. As the result of recent investigations we have such discoveries as salvarsan, chloramine, flavine, and so forth. I have referred to these achievements of organic chemistry not to promote wonder, but to stimulate imagination as to the enormous potentiality for good or evil which chemistry has, because I believe most fervently that soon the nation which fails to develop its organic chemical industry will be entirely at the mercy of the nations which develop it. British chemical

* From the Chairman's Address to the Nottingham Section on October 30.

industry has reason to be proud of its achievements during these years of war; nevertheless it is as yet but on the threshold.

What are the present prospects of industrial organic chemical industry, and what reasons have we for fearing the effects of competition? It was the high prices resulting from the removal of competition which enabled manufacturers to maintain supplies of dyes and drugs during the war. They could not be made at the old prices because the most economical method of manufacture had yet to be discovered, the requisite workers trained, and suitable plant devised. It is self-evident that new manufactures cannot be straightway installed on the very large and therefore most economical scale. During the past four years all these points have received attention and great progress has been made; nevertheless, it would have taken, even under peace conditions, a lengthy period to reduce the cost of production to the low level of German prices. Under war conditions, while attention has been diverted to maintaining supplies of munitions, and while at the same time one has been able neither to procure the necessary plant nor to train the young men to work it, it has been impossible to reach the highest efficiency. Further action is therefore needed to preserve and foster these newly-developed manufactures.

In discussing this vitally important problem we must first consider what can be done by organisation, and secondly what assistance can be afforded to the new industries by any form of protection. We are now able to study the problems of the future with a more philosophical outlook than was possible in the earlier years of the war, while we were struggling merely to attain very immediate practical ends. Manufacturers' Associations which have been formed have already accomplished a great amount. Notwithstanding this, much work has yet to be done in completing our organisation for properly marshalling our potentialities. Let it be remembered that the development of all organisation requires time and patience. In the changes accompanying that growth much or little time may be lost, according as they are revolutionary or evolutionary. If such changes are to be evolutionary the component parts of the organisation concerned must accept the same policy and follow the same ideal. Hence the need for reiterated expression of our views, for clearness in thinking and readiness fearlessly to face the facts.

If we seek to summarise the requirements involved in evolutionary change, I think it will be admitted, in the first place, that our organisation must be built up in consonance with our natural development without slavishly copying the example of any other country, for in the latter case the structure resulting would be incapable of standing the test of time. It must be compatible with British character. Let it be remembered that British resource and independence have largely contributed to our great success in the present war. That character has been built up under conditions of freedom which it must be our first duty to preserve amid the novel elements arising out of peace. Above all things, our initiative needs to be strengthened, and we know that initiative is being daily squeezed out of us by the present system of Government control, necessary though it may be. There is considerable danger lest, in our revulsion against and desire to free ourselves of this yoke, we make the great mistake of rebelling against all forms of government or other organisation. No greater or more fatal error could be made, for having fallen behind in certain respects, unity of effort and the utmost co-ordination of our forces alone can put us in our rightful place, which is in the very forefront of chemical industry. It must be clearly recognised that the assistance and guidance of the Board of Trade, the Ministry of Reconstruction, and other Government Departments are imperatively needed, but not their control. As far as possible we must aim at entire independence from State control, and must look to our own organisation for such internal interference as may be necessary to ensure the co-ordination of its individual parts. Trade jealousies need to be subdued and a policy of co-operation substituted for the old cut-throat competition, and as far as possible the wasteful overlapping which now exists must in the future be avoided. The fundamental aim of the present generation of men responsible for this department of chemical industry needs to be the building up of a great national industry for home and foreign trade, and we have little prospect of success unless we place this objective of a wise co-operation before all others. In the fine chemical industry a large proportion of the substances required are not needed in sufficiently large quantities for continuous production on the large scale, so that a compound may have to be made for a period only and the work then suspended. Such intermittent working naturally increases the cost of production. The starting up and closing down of a plant require much unproductive labour and supervision, while the period when it is out of use involves continuous costs of one kind and another. If several manufacturers are at any time producing the same substance under similar unfavourable conditions, it is obvious that combination among them for production on a more uniform and continuous basis, with combined technical experience, will enable great economies to be effected. Similar advantages would be gained if a number of quite small plants, though working continuously, were to be combined and the required output manufactured on one large plant. Let me exemplify this with a simple instance from the fine chemical trade. A number of firms are manufacturing salts of bismuth on what may be regarded as a very small scale, that is to say, hundredweights and not tons per week. If technical knowledge were pooled the whole could be done in one works with a fraction of the present staff and with much greater efficiency. For the oxidation of the metal nitric acid is generally, if not universally, employed; but no one of the firms is making bismuth salts on a sufficiently large scale to maintain a nitric acid plant; consequently pure nitric acid is transported under great difficulties and expense to each manufacturer. The possible economies in the latter connexion alone are great enough to justify a combination of manufacturers for this purpose. But you will say: If the production of bismuth salts is transferred to one of the present group, what work are those relinquishing the manufacture to do? My answer is that there are more than enough manufactures of the kind in question to go round if each line is treated similarly, and, moreover, if such a policy were adopted the better position we should hold would greatly increase the production by enabling us to secure an immense export trade. In this connexion let me remind you that the present imports of chemicals are on an enormous scale, three-and-a-half millions sterling in September of this year!

If competing countries adopt a proper unification policy in their chemical industries (and we know that they are so doing), it can be only a matter of time before those not adopting such a policy are completely subjected to those that do. It is useless, therefore, to rely upon trade stimulants, such as fiscal protection, control of raw materials, and so forth: these may be temporarily of great help, but in the long run co-ordination will result in the greatest efficiency, cheapest production, and largest trade. Nor must we comfort ourselves by the reflection that Germany, our great antagonist, will

emerge from this war so stricken that we shall be in a position to dictate industrial conditions. The Germans are an industrious race, and it will be through the chemical industry that their greatest effort to recover will be made. By means of that industry they will seek to re-establish their depleted stocks of food and raw materials, which they will exchange for chemical products. This was unmistakably indicated by the character of the cargo carried by their mercantile submarines, consisting largely of dyes, drugs, and photographic chemicals. We lost the dye trade because we had insufficient faith in the value of chemistry in industry, and because we lacked belief in scientific education. Technical supremacy might have been ours in chemistry, as well as in engineering, had we taken heed to these things. By a disciplined and co-operative use of chemical and engineering knowledge, no industrial problem capable of achievement is beyond the power of British chemists. What is needed is team work, energy, patience, with opportunity for the more brilliant individuals in our midst. If we show capacity for these things, surely the old feeling that the achievements of chemical manufacture are too difficult and too speculative for capital enterprise will disappear; but one thing which is needed to bring this about is that some knowledge of chemistry shall be possessed by a great majority of educated people in the country. The first step towards effective organisation in Great Britain was the formation nearly three years ago of the Association of British Chemical Manufacturers, which is now very actively at work. Its membership already represents a capital of over fifty millions. It is through this channel that every firm should unite to carry out such plans as I am forecasting. The Association is fully representative of the chemical industries, and is assured of recognition in all Government Departments. One of its main objects is to assist the integral parts of the chemical industry, to co-ordinate their efforts in such a way that the development of the whole chemical industry should be an aim, if not the chief aim of every firm engaged therein. This end cannot be achieved unless each member makes individual efforts to develop his business with the utmost strength and efficiency, not looking for immediate profit in all that is undertaken, nor wasting effort by destroying or weakening the work of others by unwise competition. The Association is concerned, of course, with a great many problems besides those to which I am now referring, yet an advance towards the solution of the latter has already been made by the promotion of a central exchange and the good understanding it has created among manufacturers.

The combination of groups of manufacturers for such purposes as control and purchase of raw materials, technical co-operation, and avoidance of overlapping, may not be attainable without pooling of profits, capital exchange and so forth, and therefore may remain outside the province of this Association, but they can only be brought about by slowly and firmly establishing relations between the firms, and this work the Association is assuredly doing. The riches and strength of the British Empire depend on the ability of its own industrialists to work up the vast possessions of raw material. Derived from the latter are coal tar and carbide—the bases of most organic syntheses—it is therefore of importance to the Empire as well as to the success of the organic chemical industry that there should be organisation of and co-operation with the distillers of coal tar. The same is equally true in regard to intermediate products derived from coal tar and to by-products derived from specific manufactures. It must not be supposed that merely by adopting such proposals for combined effort we shall be creating as an organic whole a British industry capable of self-development and complete independence. It is also necessary that our scientific work should be thorough in every detail, and this requires that unprofitable reduplication of work should be avoided. In addition, much will depend on the amount and quality of effort contributed by the chemists. No detail of manufacture must be too small for the attention of the laboratory, no enthusiasm too great. Every possible safeguard must be made by careful organisation for the sympathetic co-operation of the laboratory and factory. The laboratory investigations should not be considered complete until all permutations of conditions have been given a trial, each limiting factor determined. We must hold an ever open mind with respect to processes, and learn all we can from statistical results obtained in the factory as regards yield and cost of production.

It often happens that new conditions arise necessitating a re-investigation of a process. Variations in the cost of labour, in the price of fuel or raw material may each render necessary fresh laboratory investigations with a view of increasing efficiency. In organic chemical manufacture as well as in industry generally, the industrial chemist is largely concerned with questions of economy and avoidance of waste, and this is a function of our research laboratories to which much attention must be given. Some of these problems are simple, but others can only be solved by precise and painstaking investigation. In industrial research, besides the study of the chemical reaction concerned, the chemist has to investigate quantitatively from the point of view of cost, and this dual aspect of each problem calls on the one hand for originality, care and assiduity, and on the other for the use of the imagination and application of common sense, qualities not produced by education alone, but possessed only by men of best brains and ability. It is the latter which are especially needed by chemical industry. In order to secure them the conditions under which such men work in industry, and their remuneration, have to be yet further improved.

It is of great importance in all organisation that men should be occupied with the work for which they are really best fitted. In this connexion reference should be made to our imperative duty of finding work for the returned soldiers. While we have been labouring in privileged security, those men have suffered so much and risked all; and the life-time remaining for many of them will be sadly affected by the sacrifice they have made. The duty of finding work for those men should nowhere be accepted with greater alacrity than in the chemical and engineering trades, for it is in them that the greatest measure of military exemption has been granted. As a practical problem this calls for careful thought. The crude idea that the cripple can do nothing must be set aside; in many cases by rearrangement of duties the work can be carried out, even better by the physically defective than by the physically perfect man. Our difficulty lies in fitting the man and the job, taking into careful consideration the nature of his defects. One does not need two perfect legs in order to read thermometers, to watch a reaction vessel, to make routine tests, to make calculations, or plot curves; and most live men of moderate health can be made capable of doing useful work of some sort. This, however, is a digression. I have appealed for organisation amongst those engaged in the various departments of chemical industry in order to economise national effort, but there are other things which concern the future of chemical industry, such as the question of control of raw materials, patent protection, fiscal protection, and so forth These expedients will only be satisfactorily procured if we are properly organised; and firstly we must

convince ourselves as to what is needed. We know with what skill German combination secured for its own needs a vast amount of the world's raw material, much of it derived from the British Empire. One of many splendid achievements of our Government Departments during these years of war has been to control supplies of raw materials. By a wise policy of the Board of Trade, assisted by such great industrial organisations as the Association of British Chemical Manufacturers, this control can be retained to the great advantage of British industry.

I am not one of those who consider that the case for a general adoption of protective tariffs is at present established beyond controversy; but it can already be seen that certain newly-developed industries which are regarded as essential to national safety must be shielded until they are firmly grounded from the inevitable attack which will be made upon them as soon as peace conditions are re-established. Of these the chemical industry is probably the most important. The old free trade argument that capital and labour are best employed in producing those goods which can be more cheaply made at home and exchanging them for imported goods, the manufacturing conditions for which are less favourable, certainly does not apply when the safety of the nation is at stake. Further, there should surely not be any avoidable loss of the extensive capital invested by the nation in new branches of industry during the war, nor a loss of the skill acquired by such great effort, to say nothing of the need of every outlet for the available manpower set free at the conclusion of hostilities, and available to replace the wealth expended during the war.

It is important that the improvement in the wages paid to chemical workers, as well as in the remuneration of chemists themselves, which has happily taken place during the past few years, should be maintained, so that a permanent improvement in the general standard of living may result, and this will be extremely difficult to achieve without some measure of protection, although the increased consumption rendered possible by this improved standard and the use of labour-saving machinery should enable us eventually not only to maintain, but to extend the improvement. The restrictions obtaining during recent years, which will probably apply for several years after he conclusion of war, have made it difficult or impossible to procure machinery except for the production of war materials. On these grounds unrestricted competition in the newly-developed sections of the chemical industry is likely to prove disastrous to them.

It is obvious that a nation to be fully efficient should, generally speaking, keep alive only those enterprises which are individually efficient, and if only a high uniform standard can quickly be reached we have little to fear. Nevertheless, without some assistance by legislative or Government action to restrict competition during the period of reconstruction, it is certain that many organic chemical manufactures which have been established with great effort during the past four years will again be lost to this country. This statement is based on information which reaches me from many quarters, and, it may be mentioned, already several factories have been closed on account of competition from America. My earnest hope is that the Government will impartially investigate the matter, for I know that in this event organic chemicals generally will be assured of the treatment which it has already been decided to apply to dyes.

The war marks a new epoch for chemists, and a clarion call resounds through the country. It has been my endeavour in this address to echo that call, however feebly, to appeal for unity of ideal and effort, for the sunny atmosphere of the cricket ground in the natural rivalry between competing firms, for mutual confidence, linking up of interests and national effort in chemical industry which shall not be unworthy of our heroic national effort in the field.

STATE ASSISTANCE TO THE DYE INDUSTRY.

MEMORANDUM BY THE BOARD OF TRADE ON THE SCHEME FOR THE ALLOCATION AND ADMINISTRATION OF THE FUNDS PROVIDED BY PARLIAMENT FOR THE DEVELOPMENT OF THE DYE INDUSTRY BY MEANS OF FINANCIAL ASSISTANCE TO COMPANIES AND FIRMS IN AID OF DEVELOPMENTS, EXTENSIONS AND RESEARCH. [Cd. 9194, 2*d*.] [Abstract.]

I. *Objects*.—The primary object of giving financial assistance to the dye industry is to ensure a supply of dyes to the textile and allied trades, and thus render them independent of the German industry. It is also desired to promote the manufacture to such an extent that British firms may be able to compete in the world's markets.

The financial aid will be of two kinds:—A. Loans; B. Grants-in-Aid of (i) Buildings and Plant, and (ii) Research.

A. Loans will be made more particularly to further the production of special classes of dyes not hitherto made in this country or only to an insufficient extent, and the manufacture of which entails unduly heavy outlay on plant and equipment.

B. (i) Grants-in-Aid will be given mainly for the purpose just mentioned, and with the primary intention of meeting special depreciation and obsolescence, and increased costs due to war conditions. These grants will not exceed 40 per cent. of the cost of the plant and buildings on account of which they are made. (ii) Research is to be understood to mean specialised technical research conducted in close connexion with actual manufacture of dyes and advanced intermediates. Grants for this purpose will not exceed, (*a*) 40 per cent. of the cost of any extensions of laboratory buildings and equipment, (*b*) 40 per cent. of the annual maintenance costs of such laboratories.

II. *Conditions of Loans and Grants*.—The loans or grants must be applied to develop in the shortest time the manufacture of colours which are in short supply, the nature and quantities of which shall be determined, or approved, by the Board of Trade. Applicants must furnish such particulars of their businesses as the Board may require. No loans shall exceed 50 per cent. of the net value of the material assets of the firm concerned, this value to be determined by the Inspector of Accounts Profit disbursements to be limited to 8 per cent. upon the amount of the capital (ascertained as above), until the conditions of the loan or grant are fulfilled. Loans to be repayable within 20 years and, if required, to be secured by mortgage or floating charge upon the whole assets; the rate of interest to be 1 per cent. above bank rate with a minimum of 5 per cent. After making proper allocations to meet depreciation, interest on loans and debentures, excess profits or similar duty, if any, the loan shall be paid off at the rate of 10 per cent. of the remaining profits; if more than 8 per cent. has been earned on the "effective" capital, 50 per cent. of the surplus to be allocated to the reduction of the loan. The value of any concessions granted for special depreciation and obsolescence in respect of excess profits duty, to be refunded to the Board in part liquidation of the loan. Manufacturers shall undertake to supply all their products at reasonable prices and to distribute them amongst consumers in an equitable manner; in the event of non-compliance, the Board may fix prices or divert

the distribution. Contracts or agreements with foreign manufacturers to be approved by the Board, and foreign participation not to exceed 25 per cent., either in capital or voting power.

III. *Procedure.*—The scheme will be administered by the Dyes Commissioner, who will be advised and assisted by (1) a Loans and Grant Allocation Committee consisting of six members appointed by the Board with the Dyes Commissioner as chairman, (2) a Trade and Licensing Committee, (3) an Inspector of Research, and (4) an Inspector of Accounts.

The Trade and Licensing Committee will consist of nine members with the Dyes Commissioner as an *ex-officio* member (additional) without a vote. The Committee will be constituted as follows:—An independent chairman appointed by the Board of Trade; four members representing colour users; and four members representing dye manufacturers.

The representatives of the colour users will be nominated:—As to three by the Colour Users Committee, and as to one by the National Federation of Associations of Paint, Colour and Varnish Manufacturers. They may be members of the respective trades concerned as colour users, but shall not be dye manufacturers, or connected with any dye manufacturing business, except that shareholding shall not of itself be a disqualification.

The representatives of the dye manufacturers may be members of any branch of the dye manufacturing trade and will be nominated as follows:—British Dyes, Ltd., and Messrs. Levinstein, Ltd., will jointly nominate two members; the Dye and Intermediates Section of the Association of British Chemical Manufacturers and the Board of Trade, one member each.

The functions of the Committee will be:—1. To determine what colours and intermediates shall be licensed to be imported into the country after the war and in what quantities. For this purpose the Committee will appoint four of its members to form a Licensing Sub-Committee, two selected from the representatives of the dye users and two from the representatives of the dye manufacturers, and the chairman of the Committee will be the chairman of the Sub-Committee. The latter will be the licensing body subject to the final authority of the President of the Board of Trade. 2. To advise the Dyes Commissioner as to the colours and intermediates the manufacture of which should be specially encouraged and the order of their importance.

Only manufacturers of finished dyes and/or advanced intermediates will be eligible to come under the scheme; the producers of primary intermediates (benzol, toluol, phenol, anthracene, etc.) are excluded. Information concerning home production and import trade will be furnished by the Board of Trade, and manufacturers will be asked to submit proposals for manufactures they intend to undertake. The particulars to be furnished by manufacturers include:—Nature and quantities of dyes, estimates of time required to attain outputs, previous outputs, estimates of expenditure, depreciation, details concerning the scientific and technical staffs and laboratories, and complete financial accounts. The particulars of the proposals regarding the classes of dyes and intermediates proposed to be manufactured are to be referred by the Commissioner to the Trade and Licensing Committee, which shall make recommendations thereon, and also on the desirability of limiting production in any desired direction.

The report of the Trade and Licensing Committee will be submitted to the Loan and Grant Allocation Committee, which shall then recommend the amount of financial assistance, if any, to be granted.

The agreements between the Board of Trade and manufacturers in respect of loans and grants will be on the general lines of the model forms annexed to the memorandum.

CORRESPONDENCE.

THE BRITISH DYE INDUSTRY.

SIR,—In the interest of scientific development and its consequential effect upon industry, I am instructed to ask you to insert the following Memorandum on the Dye Situation which has been addressed by my Association to the President of the Board of Trade:—

THE ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

Memorandum to the President of the Board of Trade—Setting forth the views of the Executive Council of the above Association on the present situation in that section of Chemical Industry directly concerned with the production of Dyes.

The Council is of opinion—

1. That a wider and more comprehensive Scheme of a completely national nature is immediately requisite, if a supply of the colours, in variety and quantity essential to the conduct of our great textile industry, is to be forthcoming within a reasonable period of years, and especially with a view to the early elimination of all dependence on overseas supplies.

2. That the fundamental error which resulted in an inadequate policy in British dye production, is the failure on the part of the originators of that policy to recognise the fact that the manufacture of dyes is not, by itself, an industry apart; but is precisely an integral part of, and is dependent upon, the operations covered by the chemical manufacturing industry as a whole, *i.e.* the manufacturers of heavy chemicals, of fine chemicals, of tar products, and of explosives, have each and all separate functions to perform in developing a successful dye-producing industry in this country.

3. That the apparent failure to grasp the essential condition set forth in paragraph 2 has been the cause of the otherwise incomprehensible unwillingness on the part of the Governmental officials concerned to consult this entirely representative Association of Chemical Manufacturers, and even to refuse the conference offered by an expert committee of the Association some months ago.

4. That the general trend of what Lord Moulton said at Manchester in December, 1914, is correct, when he pointed out that broadly speaking the manufacture of the greater proportion of essential intermediates should be conducted at the existing chemical works of the country, leaving the actual production of the finished colours to be in some measure centralised.

5. That no such comprehensive scheme has yet been formulated, with the result that firms capable of adding useful weight to dye production have had insufficient opportunity for doing so, and that unless such opportunity is created, not only will time be lost, but unnecessary capital expenditure incurred in the erection of plant which already exists in whole or in part at the chemical works of the country.

6. That the past and present schemes have not included the whole of the country's resources of knowledge in actual colour production, and that, in short, there are potential dye makers who have not been used sufficiently, and whose powers of production have not been developed to the extent of which they are capable.

7. That the problem of distributing to the best advantage the large sums of money recently voted by Parliament for the development of the dye industry is one upon which this Association should advise. It is also felt that the questions of priority for purchase of dye-making plant and the utilisation of materials are also matters in which the

wide knowledge of this Association can be used effectively, and it is urged that unless measures of co-operation of this nature are adopted the dangers of duplication of plant and of overlapping in processes will be seriously increased.

8. That unless co-ordinated action can be brought about to a much greater extent than is at present indicated, the problem of meeting external or overseas competition in peace time will be more difficult and dangerous than is at present foreseen.

9. That the development of a British organic chemical industry, capable of keeping abreast of industrial achievements in the synthetic production of dyes, drugs, explosives, poisons, etc., is essential to the safety of the Empire. In this connexion it is clear that the dye industry should be intimately co-ordinated with the other sections of organic chemical industry if the success of the whole is to be secured.

10. To sum up, it is considered that—

(1) An immediate co-operative effort is called for and that a wider interest should be appealed to.

(2) The formation of those companies on which colour production will fall, should not be confined in any sense.

(3) The whole chemical industry should be encouraged to assist, with both knowledge and money, an enterprise which is so vital to the maintenance and development of some of the country's most important industries.

As a consequence of this the directing or controlling body should be representative not only of colour-producing interests and colour users, but also of those other and equally important factors in chemical manufacture, the good will and assistance of which is of paramount importance in the National effort which has become essential.

November 1, 1918.

In reply to this, the following letter has been received from the Dyes Commissioner:—

Dyes Department, Board of Trade.
7 Whitehall Gardens, S.W. 1.
Ref. 1M/4502. 8th November, 1918.

Dear Sir,—With reference to your letter of the 1st November addressed to the President of the Board of Trade, which has been referred to me, enclosing a memorandum setting forth the views of your Association in connexion with the development of the British Dye Industry, I have to inform you that full details of the scheme which H.M. Government propose to adopt for affording further assistance to the Dye Industry were presented to Parliament on the 6th instant, in the form of a White Paper, from which it will be observed that representation of your Association on the Trades and Licensing Committee which is to be set up under the scheme has been provided for.

I am,
Yours faithfully,
(Signed) EVAN D. JONES.
Dyes Commissioner.

The General Manager,
Association of British Chemical Manufacturers.

From this it will be seen that only one of the points referred to in the Memorandum has been met, and that only to the extent of the appointment of one representative of this Association out of nine members of the Trades and Licensing Committee.

In view of the national importance of this matter my Association deems it necessary that the public should be informed of the position.—I am, Sir, etc.,

G. MOUNT,
Secretary.

THE ALKALOIDS OF OPIUM.

D. B. DOTT.*

Opium is an extract formed by evaporation of the juice which has exuded from incisions made in the capsule of the poppy (*Papaver somniferum*). The drug was formerly imported principally from Asia Minor, but after the outbreak of war mainly from Persia, and more recently from India. Of the twenty alkaloids which have been found in opium or in the residues of its manufacture, only a few exist in sufficient quantity to become articles of commerce, and of these few a still smaller number are in actual demand. Morphine is the principal alkaloid from the point of view both of importance and of quantity. Narcotine, papaverine, thebaine and codeine may be taken in sequence as quantitatively important. All the bases may be considered as existing in combination with acids, the chief of which are meconic and sulphuric. The alkaloids may be conveniently divided into two classes, those which decompose ammonium salts when heated with their solutions, and those which do not. Morphine, codeine, and thebaine belong to the former class, narcotine, papaverine and narceine to the latter.

There are two leading methods for treating the opium in order to obtain the alkaloids. The first is to add calcium chloride to the aqueous solution, whereby a precipitate of calcium meconate and sulphate is produced, while the alkaloids remain in solution as hydrochlorides. On evaporating the solution the morphine and codeine crystallise as hydrochlorides. When the mixed salt is dissolved and treated with ammonia the morphine is precipitated, and the codeine passes into the filtrate and washings, from which it may be extracted by any suitable solvent such as chloroform. The morphine and codeine are purified by recrystallisation and incineration. The other alkaloids are recovered from the dark mother-waters of the crude codeine and morphine muriate. Papaverine separates readily as acid oxalate and thebaine as acid tartrate, leaving narcotine in solution. The second method is to treat the opium solution with lime, which precipitates the narcotine, papaverine and thebaine, the morphine and codeine passing into solution. Morphine is very sparingly soluble in water but it combines with lime and baryta as well as with the fixed alkalis, to form readily soluble compounds. On adding ammonium chloride to such a solution the morphine is precipitated, while the codeine passes into solution.

Morphine is interesting historically as being the first organic base to be isolated. It was prepared in 1806 by Sertürner, its composition being subsequently determined by Laurent. Morphine is not only by far the most important of the opium bases, it is medicinally the most valuable of all the alkaloids. It crystallises from alcohol in well-defined prisms, containing 1 molecule of water. The hydrate very generally indicates the composition $B_8(H_2O)_9$, but the excess is believed conveniently to be merely interstitial or hygroscopic moisture. Morphine is represented by the empirical formula $C_{17}H_{19}NO_3$. Much interesting research on the constitution of the molecule has been performed. It may here suffice to say that it has a phenanthrene nucleus; a methyl group attached directly to the nitrogen; two hydroxyl groups, one of which has a phenolic function, the other alcoholic. Morphine is readily oxidised. Hence permanganate is a good antidote, if quickly administered. A large number of derivatives has been obtained, but only one or two are of practical importance. By replacing the phenolic hydrogen with sodium, and reacting with alkyl halide or ester, such compounds as methyl-morphine

(codeine) and ethyl-morphine are obtained. Both are used in medicine. By the action of some of the anhydrides the hydrogen of both hydroxyls may be replaced by acid radicals. Diacetylmorphine is in large demand, because it is supposed to have certain advantages over morphine. The only other derivative which is much used is apomorphine. It is a powerful emetic and useful expectorant. Apomorphine differs in composition from morphine simply by the elements of water, but is not produced by any recognised dehydrating agent. It is usually formed by the action of HCl at a moderately high temperature. The reaction may be considered as taking place in two stages:

$$C_{17}H_{19}NO_3+HCl=C_{17}H_{18}ClNO_2+H_2O.$$
$$C_{17}H_{18}ClNO_2=C_{17}H_{17}NO_2+HCl.$$

Codeine exists in considerable quantity in opium, and can be prepared from morphine when required, by methylation. The composition is represented by the formula $C_{18}H_{21}NO_3$. It may be crystallised from alcohol, and forms very fine prismatic crystals. Although codeine is a strong base, and forms conveniently soluble salts, it is principally sold as alkaloid. Next to morphine, it is the opium alkaloid in most demand. In its physical properties it differs from morphine, in having a much lower melting-point (155° C.), in being moderately soluble in water, and in being soluble in benzene and chloroform, in which morphine is nearly insoluble. Codeine contains but one hydroxyl group and therefore forms only a monacetyl derivative. By the action of hydrochloric acid at 100° chlorocodide ($C_{18}H_{20}ClNO_2$) is formed with elimination of H_2O. On heating to 150° C. with the same acid, apomorphine is produced, methyl chloride being eliminated, showing that codeine differs only from morphine in the fact that one of the hydroxyls of the latter is replaced by methoxyl. Many derivatives of theoretical interest have been obtained. Of these especial mention may be made of methylmorphimethine, produced by heating the methylhydroxide of codeine. From the examination of this new tertiary base very full information as to the constitution of codeine, and therefore of morphine, has been obtained.

Thebaine has marked basic properties. It has the composition $C_{19}H_{21}NO_3$, melts at 193° C., is nearly insoluble in water, readily soluble in alcohol, and still more so in chloroform. It is the most poisonous of the opium alkaloids, having a tetanising action like strychnine, but it has also a narcotic action, and might perhaps be more used than it is. Thebaine is remarkable in being very easily changed by dilute hydrochloric acid. At first there seems to be formed an isomeric crystalline body, but the general result is a homologue, $C_{18}H_{19}NO_3$, which strikes a purple colour with sulphuric acid instead of the pure red given by thebaine. Thebaine contains no hydroxyl, but two methoxyl groups, and may be represented as:

$$(CH_3O)_2.C_{16}H_{12}O.NCH_3.$$

It has the same phenanthrene nucleus as morphine and codeine.

Narcotine has the formula $C_{22}H_{23}NO_7$. It is a weak base, its acetate, for instance, being decomposed by hot water. It contains no hydroxyl, but three methoxyl radicals, which can be successively removed forming dimethyl-nornarcotine, methylnornarcotine and nornarcotine. Narcotine is hydrolysed by water at 140° C., forming opianic acid and hydrocotarnine. When treated with zinc and hydrochloric acid, it is resolved into meconine and hydrocotarnine: $C_{22}H_{23}NO_7 + 2H = C_{10}H_{10}O_4 + C_{12}H_{15}NO_3$. Oxidising agents produce opianic acid and cotarnine: $C_{22}H_{23}NO_7 + O + H_2O = C_{10}H_{10}O_5 + C_{12}H_{15}NO_4$. The hydrochloride of the latter is largely used as a styptic. The oxidation is generally effected by manganese dioxide and sulphuric acid. Opianic acid is monobasic and has aldehydic properties: $C_6H_2(OCH_3)_2(CHO)(COOH)$. On distilling with excess of soda lime it yields methylvanillin, from which vanillin may be obtained by the action of halide acid, but the yield is not good. Meconine is the lactone of the alcohol produced by the reduction of the aldehyde group in opianic acid. It is clearly proved that narcotine is built on the isoquinoline nucleus, and the reactions of cotarnine and opianic acid enable a formula to be constructed with considerable certainty.

Papaverine, like narcotine, is an isoquinoline derivative. It has the empirical formula $C_{20}H_{21}NO_4$, is a weak base, and may readily be crystallised from alcohol. It has feeble narcotic properties, and is not largely used, but the salts are in some demand. It contains four methoxyl groups. By fusion with alkali, papaverine yields dimethoxyl-isoquinoline and dimethylhomopyrocatechin, and the manner in which the two groups are united having been determined, the constitution may be stated with certainty. It is simply represented by the formula $(CH_3O)_2C_9H_4N.CH_2.C_6H_3(CH_3O)_2$.

Narceine is a weak base of the composition $C_{23}H_{27}NO_8$, and at one time was in considerable demand. The fact that it is fairly soluble in hot water renders its separation from the other weak bases an easy matter. It may be formed artificially from narcotine by acting on the methochloride of the base with soda:

$$C_{22}H_{23}NO_7.CH_3Cl+NaOH=C_{23}H_{27}NO_8+NaCl.$$

From various reactions the following formula may be derived: $C_{16}H_{11}O_2N(CH_3)_2.(OCH_3)_3(CO)(COOH)$. The other alkaloids which have been found in opium, or in the residues of its manufacture, are pseudomorphine, codamine, laudanine, laudanidine, laudanosine, tritopine, meconidine, lanthopine, protopine, cryptopine, papaveramine, gnoscopine, oxynarcotine, and rhœadine.

NEWS FROM THE SECTIONS.

CANADA.

The annual report issued by this Section states that regular meetings were held during the session 1917-18 at Montreal, Toronto, and Ottawa. Of the papers read at these meetings five have appeared in the Journal of the Society, the others will be published in pamphlet form by permission of the Council, a grant for this purpose being given by the Ontario Government. Meetings of the Section were inaugurated in Ottawa, where a branch of the Society was subsequently formed.

The annual meeting was held, for the first time, in Ottawa, to which chemists from all parts of the Dominion were invited (this J., 1918, 274 R). The attendance was beyond all expectations, and a plan for the organisation of the Section on a broader basis was adopted. Support was also given to the formation of a Chemists' Association, and committees were appointed to urge upon the Government: the necessity of permitting the manufacture in Canada of alcohol free of duty for industrial purposes; the establishment of a central bureau of standards; the non-withdrawal of chemists from essential industries for enlistment, and the establishment of a federal scheme for technical education.

Official copies of the Journal are kept on file in Toronto and Montreal by the courtesy of the Council.

NEW YORK.

About 250 members and guests attended the meeting on October 25 in the Rumford Hall of the Chemists' Club. Major C. Sholes, who presided,

gave an address on "The Relation of Chemical Industry to Army Requirements," and showed how co-operation had been brought about through the War Industry Activities Board and various Government Departments. After the Secretary had given notice concerning the Grasselli Medal and stated its purpose, Mr. Jerome Alexander presented a series of resolutions laying bare and denouncing the German war-time policy of doing permanent economic injury to future industrial competitors by destroying and removing machinery and property, by deporting or destroying communities of skilled artisans, and by killing or treating brutally prisoners of war and innocent civilians in order to deprive their countries of their skill and labour. The Allied Governments were requested to take note of these facts, and to insist on all stolen property being restored or replaced, and on all Allied industries being adequately safeguarded against future dependence on German industries. The resolutions were adopted unanimously and the Secretary was instructed to forward them, in the name of the Section, to the proper authorities, in order that they might reach the Peace Commission. The rest of the evening was devoted to a very instructive address on "Gas Warfare, Offensive and Defensive" by Major H. W. Dudley of the British-American Anti-Gas Service.

NEWCASTLE.

Dr. P. Phillips Bedson, the new chairman, presided over the annual meeting of this Section on October 30 last.

The annual report of the Section expressed regret at the resignation of the hon. secretary, Mr. E. F. Hooper, who had gone to live in the South, and stated that he had faithfully and honourably served the Section for a long time as a member of the committee, chairman and hon. secretary. Mr. H. D. Smith had been appointed hon. secretary in his place. The report proceeded to detail the work of the past session, which began with 134 members and ended with 166. It was agreed that, subject to the approval of the Council, the March meeting of the Section should be considered as the annual meeting in the future. On the suggestion of the chairman, it was agreed to invite the Society of Chemical Industry to hold its next annual meeting in Newcastle. Dr. Bedson then delivered his address in which the present position of the chemical industry on Tyneside was compared with its position in 1886.

MANCHESTER.

The first meeting of the new session was held on November 8, Mr. Wm. Thomson presiding over an exceptionally good attendance. The chairman read some notes on "The Rationing of Heat and Light in Manchester" which dealt mainly with the relative values of the available sources of heat and light as set out in "The Household Fuel and Lighting Order, 1918." Comparison was also made between the quality and costs of pre-war and post-war gas. The removal of benzol, toluol, etc., reduced the value by 23 per cent. and the price now charged was more than double the pre-war price. Coal burned in an open fire-place radiated about 27½ per cent. into the room, gas fires radiated 50 per cent. and electric heating 100 per cent. The cost of producing 1 million B.Th.U.s of effective heat would be: from coal at 40*s*. per ton, 4*s*. 8*d*.; from dry coke at 30*s*. per ton, 3*s*. 8*d*.; from gas at 3*s*. 4*d*. per 1000 cubic feet, 14*s*. 2*d*.; from electricity (for heating) at 1*d*. per unit plus 35 per cent. plus a further 10 per cent., £1 16*s*. 4*d*.; from wood at, say, 45*s*. per ton, 9*s*.; from peat at 45*s*. per ton, 8*s*. 2*d*.

Taking electric current for lighting at 5¼*d*. per unit, a lamp consuming 16 watts could be used for 11¾ hours and a 50-watt lamp for 3¾ hours, at the cost of one penny for current. An allowance for lighting of 7500 cu. ft. of gas, or 120 Board of Trade units of electricity per annum for a two- or three-roomed house, would permit of one burner consuming 4 cu. ft. of gas per hour, burning on an average 5 hours per day during each of the 365 days of the year. It would also allow a 16-watt electric lamp (1¼ watts=1 candle power) to be used each day for 20½ hours, or a 50-watt lamp for 6¼ hours during each day for a year.

Dr. G. Martin and Mr. J. Wood then presented some notes on "The Quantitative Testing of Rainproof and Waterproof Cloth," in which the various processes of waterproofing fabrics and of testing them were reviewed, most attention being given to the "drop" test, the reliability of which was questioned by several speakers in the subsequent discussion.

The last item was by Mr. E. Wray on "The Indophenine Reaction for the Detection of Thiophene." The author stated that his attention was called to the above subject some years ago when he had occasion to use the indophenine reaction and, to his surprise, he obtained a green coloration instead of a blue one. He made a test in a separating funnel, and noticed that a blue coloration was slowly produced where a small quantity of the reagent wetted the stopper, which suggested that moisture or slow oxidation by means of air was necessary for its production. The result of tests performed with synthetic thiophene and pure acid was to prove that the presence of an oxidising agent was essential to the formation of the blue coloration. Hence the addition of one drop of nitric acid was recommended in performing the test with pure sulphuric acid.

The annual report of the Section states that the past session was notable for the large attendance at the meetings; but, unfortunately, there were not many offers to read papers. The committee has actively supported the scientific societies of the city in their demand for a National Technical Library in Manchester, and sent deputies to interview the Lord Mayor with a view to provision being made to house such a library in the new building it is proposed to erect.

YORKSHIRE.

On November 11, a meeting was held at Leeds Mr. W. McD. Mackey presiding, at which Mr. F. W. Richardson read a paper entitled "A Ready Method for the Estimation of Gases Dissolved in Water, etc." The eudiometer described was a modified form of one previously devised by the author (this J., 1910, 198).

The second paper was by Mr. I. Graham on "The Accurate Determination of Carbon Monoxide in Gas Mixtures." The author showed that the apparatus described by Graham and Winmill (this J., 1914, 944) has been much improved by the introduction of a small steam bath for raising the temperature of the U-tube containing iodine pentoxide. The steam bath also holds a U-tube containing palladised asbestos, connected on the one side—through a three-way stopcock—to the apparatus, and on the other to the ordinary form of Haldane combustion pipette. With these modifications, carbon monoxide and dioxide, hydrogen, methane, and other unsaturated hydrocarbons can be estimated readily with an accuracy of 0·02 per cent. Another (portable) apparatus was described for measuring quantities of monoxide in gas mixtures when present to an extent of less than 0·2 per cent.; by means of it an analysis could be made in five minutes, with an accuracy of 0·005 per cent.

EDINBURGH.

At the meeting held on November 12, Dr. A. C. Cumming read a paper on "Technical Applications of Catalysis."

After reference had been made to the diversity of problems presented by well-known cases of catalytic reactions, special attention was given to examples of oxidation by air by means of catalysts. It was shown that by successive oxidations of glucose or sugar in presence of catalysts, oxalic acid could be obtained with a small loss of one catalyst (nitric acid). The oxidation of ammonia with platinum as catalyst to obtain nitric acid was also described with a few illustrative experiments. In conclusion, a number of cases were mentioned in which the discovery of a new or improved catalyst would offer great technical possibilities.

BIRMINGHAM.

The opening meeting was held at the University on November 14. Dr. R. S. Morrell, who presided, acknowledged his re-election as chairman, and stated that Dr. E. W. Smith and Mr. F. C. A. H. Lantsberry had been appointed vice-chairmen. A discussion was then held on "The Chemistry of the Colloid State," the speakers being Mr. W. B. Hardy, Secretary of the Royal Society, and Mr. G. King, chemist to Messrs. Albright and Wilson, Ltd., Oldbury; and a paper was read from Prof. W. C. McC. Lewis, of Liverpool University, as he was unavoidably prevented attending. Prof. McC. Lewis pointed out that capillarity played an essential rôle in colloid problems, but unfortunately it was the least understood portion of molecular mechanics; it had advanced little since the days of Laplace. The latter's view regarding uniform attraction in space had been set aside and its place taken by the concept of valency, molecules themselves being no longer regarded as the fundamental centres of attraction, but certain atoms or atomic groups inside the molecules fulfilling this function so as to give rise to localised regions of attraction. The work of Langmuir and Harkins had caused a radical change in our view of the origin and basis of capillarity, and Langmuir's mode of treatment represented a real advance.

The paper then dealt with the electrical charges borne by colloidal particles and their effect upon stability, and other phenomena. Scientific colloid chemistry had not advanced nearly enough to meet the requirements of present-day technical practice. Its study was only beginning to be thought about seriously, and at present it was not regarded as a distinct subject for instruction and research in our universities and colleges. We could not hope for real advances in colloid technology until scientific colloid chemistry was put on a proper footing and received the attention which its fundamental importance deserved.

Mr. King explained the ultra-microscope and its application to the systematic study of colloids especially in regard to industrial practice. The determination of the degree of dispersity of colloids was of the same fundamental importance to colloid chemistry as the measurement of conductivity was to electro-chemistry.

The discussion was adjourned until December 12.

NOTTINGHAM.

The second meeting of the session was held at University College on November 20. Dr. R. M. Caven presided in the regretted absence through illness of the chairman, Mr. F. H. Carr.

Dr. E. B. R. Prideaux gave a paper on "The Titration of Pyridine-Ammonia Mixtures, and the Theory of Titration Errors," showing that the successful estimation of mixtures of these two bases depended on the choice of suitable indicators. The indicator α-naphtholphthalein serves to indicate the neutralisation of ammonia titrated with normal nitric acid, changing from a full blue colour in alkaline solution through a transitory pinkish tint to colourless. The appearance of the pinkish colour serves as a warning of the approaching end of the reaction. Congo red is then added to the colourless solution, and the titration continued for pyridine. Figures given showed a good agreement between amounts of ammonia and pyridine taken and found, but if the amounts of pyridine are small the estimated values are likely to be high.

It was also shown that pyridine and ammonia can be separated by distillation; for although ammonia is the more volatile, it is also the stronger base, and is retained in a solution of a controlled acidity owing to ionisation of ammonium hydroxide, so that pyridine distils first.

A paper on "The Effect of Heating Opium on its Morphine Content," sent from Cawnpore by Messrs. H. E. Annett and H. Singh, was read by the Secretary.

It was shown that loss of morphine commenced after about four days when the opium was dried in the steam oven, but that this loss was prevented by drying *in vacuo*, though the product was then hygroscopic.

A discussion followed, and it appeared that the loss of morphine was due to oxidation.

MEETINGS OF OTHER SOCIETIES.

THE FARADAY SOCIETY.

The first meeting of the session, held in London on November 12, was given up to a general discussion on "The Occlusion of Gases by Metals." Sir Robert Hadfield, president, contributed a very valuable review of the subject, and this was followed by another general paper, which dealt more particularly with the work of Graham and with some aspects of the occlusion of hydrogen by palladium and iron, by Prof. A. W. Porter. The latter also referred to the ambiguity of the word "occlusion," which is variously used to connote such diverse phenomena as chemical combination, simple "inclusion," solid solution and adsorption.

Mr. Cosmo Johns discussed the effect of occluded gases on the properties of metals. He thought it was necessary to distinguish between the gases absorbed as such by metals and those which are formed as a result of reactions between non-gaseous substances. The solubility of gas in the amorphous layers between the crystals was probably an important factor, and might explain certain cases of brittleness. The effect of occluded gases on the properties of metals was greater than was generally supposed. Dr. W. Rosenhain thought that as the solubility of gases in liquid metals increased with the temperature, the possibility of the formation of chemical compounds must be considered. It would be interesting to ascertain whether gas was evolved continuously on cooling. If a large quantity remained in the solid metal it was probably in solid solution. He thought the amorphous material in the boundaries played an important part.

Dr. T. Baker described some experiments which he had carried out on the gases which were given off on heating sound and unsound steel *in vacuo*. Unsound steel yielded less gas than a sound steel of the same composition. Hydrogen and carbon monoxide formed the greater portion of these gases. The evolution of hydrogen from hard steels reaches a maximum at 600° C., and that of carbon monoxide at 688° C.

Prof. C. V. Boys considered that in the case of

oxygen occluded by silver, this would all be given off before solidification took place if the molten metal was cooled very slowly.

Dr. Hatfield criticised the statement that steel containing hydrogen was brittle; all steel contained hydrogen. He stated that steel makers had a large amount of evidence about the nature and amount of the gases dissolved in molten steel, and he drew attention to the small proportion by weight which these bore to the total mass. Additions used in steel making did not prevent occlusion; they prevented the gas from being evolved on solidification.

Prof. J. W. McBain drew attention to the complexity of the phenomena, and discussed Langmuir's hypothetical explanations of these as chemical phenomena. He described some of his own experiments on the sorbtion of iodine by carbon. Dr. McCance presented a paper on "Balanced Reactions in Steel Manufacture," and suggested that the formation of blowholes depended on the ratio of carbon dioxide to carbon monoxide in the steel at the moment of solidification.

Prof. H. E. Armstrong, dealing with the solution of oxygen in silver, considered that there was every possibility of the formation of a compound of oxygen and silver.

Prof. Wilsmore reminded the meeting that very little was known about the solubility of gases in liquids; most of the data related to water, but recent work tended to show that the solubility of gases in other liquids increased with rise of temperature, as was found to be the case with metals. A number of other speakers also took part in the discussion.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At the meeting held on November 19, a paper on "The Motor Fuel Problem" was read by Dr. W. R. Ormandy, the chair being taken by Mr. C. Greenway.

In this paper the author discussed very fully a subject which is and will remain of supreme importance to many branches of industry, *e.g.*, motor vehicle manufacture, petroleum production, coal tar distillation, industrial and passenger traction and aerial navigation. It was shown that the demand for motor fuel has increased enormously in past years. In the United States alone there are about 5,500,000 motor vehicles in use, nearly 1 to 30 of the population; the output is still growing and last year exceeded 1,700,000. Assuming an average consumption of 400 gals. of petrol per vehicle, this means an additional consumption of approximately 700,000,000 gals. per annum by one country alone.

In order to meet this growing demand and to conserve supplies for the Empire it is essential that other sources of supply should be developed. One of these sources is coal-tar benzol, the potential supply of which in this country is in the neighbourhood of 50,000,000 gals. per annum; but this was only a fraction of the 200,000,000 gals. which, had there been no war, would have been the present day requirements of this country alone. Experiments have shown that a mixture of two parts of alcohol with one part of benzol can be employed in existing engines without any alteration beyond heating the air supply and possibly increasing the size of the jet. It is in a mixture of this kind that, the author stated, the solution lies. He indicated the possible sources of alcohol in this Empire, showing definitely that a quantity sufficient to mix with the benzol output can be produced, and strongly deprecated the control of benzol passing into the hands of the petroleum industry, as tending to cripple any potential alcohol industry, and he also suggested that conditions in the past have shown that motor fuel consumers have been exploited by the petrol producers.

In the ensuing discussion Mr. C. Greenway said he disagreed entirely with the deductions of Dr. Ormandy; in the first place he had omitted mention of the growing use of kerosene for internal combustion engines, the consumption of which in this country last year was 200,000 tons and was estimated shortly to reach 400,000 tons, equivalent to the pre-war consumption of petrol in this country. The figures of the world's annual production of petroleum, given as 70,000,000 tons, would to-day have been far greater under normal conditions, as instanced by the production of the Anglo-Persian Oil Co., Ltd., which at present is about 1,000,000 tons per annum, but would have been in the neighbourhood of 5,000,000 tons. As showing the possibilities of this production alone, he instanced the fact that the average percentage of motor fuel yielded by American petroleum was 10—12 per cent. yet that of Persian petroleum was over 22 per cent. He agreed with Dr. Ormandy as to the need for research on alcohol, but stated that the necessity for petrol substitutes was far distant.

Sir Boverton Redwood stated that he had no definite opinion as to the time which would elapse before there was a world shortage of petroleum products, but it would only be a question of time and we were gradually exhausting what was really a stored material. Authorities in America have estimated that in 27 years the present supplies of that country would be exhausted, and this may be a liberal estimate in view of the development of motor traction of all kinds. He urged the development of all possible sources of supplies, including alcohol, products from low-grade coals, cannels, etc., and trusted also that liquid petroleum would be discovered in this country.

Dr. Blackler pointed out the necessity of taking into consideration the development of "cracking" processes. The "cracked" products (pyrogenetic petrol) are also miscible with alcohol; the future fuel will be a mixture of petrol, cracked spirit, benzol and alcohol.

Mr. Thomsen stated that a world shortage of petroleum is not so near as claimed by Dr. Ormandy, the potential yield from Mexico alone being equal to 50 per cent. of the present yield from America.

In reply Dr. Ormandy contended that these statements only strengthened his views as to the coming shortage, it being merely a question of time. Kerosene, although suitable for engines running at steady speeds and constant load, was not suitable for variable speeds and loads, and the only real solution was industrial alcohol of which sufficient could always be produced within the Empire to satisfy all requirements.

ROYAL SOCIETY OF EDINBURGH.

After the president had delivered an opening address at the meeting held on October 28, on "The Scientific Aspect of Industrial Development," Dr. T. S. Patterson and Mr. K. L. Moudgill read a paper on "Researches in Optical Activity: The Temperature Rotation Curves for the Tartrates at Low Temperatures." By the piecing together of evidence of different kinds general temperature-rotation curves for the tartrates have been arrived at. These graphs show maxima and minima, and also a region of intersection. The influence of temperature changes, of change of solvent, of change of concentration or of change of constitution, appears to be to displace the whole series of graphs in one direction or the other, with accompanying minor alterations. The paper described the investigation of the temperature-rotation curves for tartrates at the low temperature end of the diagram, where a deep minimum was shown to exist.

THE MINERALOGICAL SOCIETY.

The anniversary meeting was held on November 5, Sir W. P. Beale, president, in the chair. Among the papers read was one by Lieut. A. Russell on "The Chromite Deposits on the Island of Unst, Shetlands." The bottle-shaped mass of serpentine which runs through the centre of the island from north to south contains chromite uniformly distributed, but varying greatly in character, being at times massive, but generally granular. Over thirty quarries are known, but only six of them have been worked to any extent. The associated minerals include kämmererite (abundant in one quarry), uvarovite, copper, hibbertite, brucite, calcite, talc, and magnetite. The rocks other than the serpentine are poor in minerals.

Drs. G. F. H. Smith and G. T. Prior read a contribution on "A Plagionite-like Mineral from Dumfriesshire." Specimens of an antimony-lead ore from the Glendinning mine contained small cavities lined with minute black crystals resembling the plagionite found in the Hartz Mountains; they were found, in analysis, to have the composition $5PbS.2Sb_2S_3$. Dr. G. T. Prior presented a note on the nickeliferous iron of twelve meteorites from different localities; the percentage of iron in these varied from 5 to 21·5, and the ratio of iron to nickel from $3\frac{1}{2}$ to $12\frac{1}{4}$.

THE CHEMICAL SOCIETY.

At the first ordinary meeting, held on November 7, Dr. H. F. Coward read a paper on "The Dilution Limits of Inflammability of Gas Mixtures," presented by himself in conjunction with Messrs. C. W. Carpenter and W. Payman.

The lower limits of inflammability of hydrogen, methane and carbon monoxide in air had been determined by H. F. Coward and F. Brinsley in specially large apparatus which enabled observers to judge whether any given mixture was capable of indefinite propagation of flame (Chem. Soc. Trans., 1914, **105**, 1859; this J., 1914, 851). The new work described showed that the lower limits of mixed inflammable gases, two or three together or even the complex mixture called "town's gas," could be calculated from the lower limits of the individual inflammable gases by means of a simple formula of an additive character, put forward by Le Chatelier, namely, $\frac{n_1}{N_1} + \frac{n_2}{N_2} + \ldots\ldots = 1$, in which N_1, N_2 .... are the lower limits of the individual gases, and n_1, n_2 .... are the proportions of the individual gases present in the lower limit air mixture.

The paper dealt also with the determination of the upper limits in air of the same three gases, taken individually and also mixed, and showed that, in the latter case, and also in the case of coal gas, the upper limits could be calculated by means of a similar formula to that applicable to lower limits.

The following are the figures for individual gases, from which the dilution limits of mixtures may be calculated :—

	Lower limit in air	Approximate upper limit in air
Hydrogen ...	4·1%	... 74·2%
Methane ...	5·6%	... 15·4%
Carbon monoxide	12·5%	... 74·2%

THE CERAMIC SOCIETY.

The November meeting was held on the 14th at the Central Technical School, Stoke-on-Trent. Sir Henry Cunynghame delivered an address, the occasion being the formal opening of the Solon Library, which is now attached to the School, thanks to the liberality of the Carnegie Trustees, who provided the purchase money, although the accommodation and upkeep fall on the Governors of the School. This library is pronounced by Sir H. Cunynghame and others to contain one of the finest collections (if not the finest) of works extant on an important technical subject. The collection includes the very scarce first edition of Bernard Palissy's works, among many other special items. Another important feature is a large collection of artistic studies and designs of the late Mr. Solon, which Sir Henry stated were of the highest excellence, and worthy of comparison with those of famous old masters such as Raphael.

The library is open to the public, subject to certain restrictions.

NEWS AND NOTES.

SOUTH AFRICA.

New Chromium Deposits in Rhodesia.—Over a year ago a deposit of high-grade chrome ore was discovered in the Umvukwes Range by Mr. A. Peake. A systematic survey has already proved the existence of 2,000,000 tons of ore, and further large quantities are expected. The ore occurs in a number of parallel lines extending over 30 miles and covering an area of 4500 acres. An average test of 300 samples shows 53 per cent. chromic acid. Besides the massive ore there is an alluvial deposit covering 1500 acres which yields a mineral that assays 48 per cent. chromic acid. Provided a branch line be constructed to connect the mines with the main line at Banket Junction (a distance of 30 miles), it is estimated that the cost of ore delivered at Beira will be less than 35*s.* per ton. There are plentiful supplies of water, fuel and labour. The property has been offered to the Imperial Government under special terms and the resident mining engineer of the British South Africa Co. has sent a very favourable report to the Government authorities.—(*U.S. Com. Rep., Sept.* 25, 1918.)

CANADA.

Molybdenite from Quebec.—In our issue of August 31 (319 R) we published a statement, which emanated from the Agency General of the Province of Quebec, that over 100 tons of Quebec molybdenite had been recently delivered in London at the rate of £1000 per ton. A correspondent having drawn our attention to the presumptive inaccuracy of this statement, inquiries were instituted in official quarters, as a result of which a letter has been received by the Agent General for Quebec from the Ministry of Munitions stating that the figures quoted were inaccurate, and that "the total imports into the United Kingdom since 1915 have not reached one-tenth of the quantity named, while the price quoted is more than double the actual value. A uniform price was fixed in 1915 for all British production of this ore, and the Canadian imports only obtained the same price as that paid for Australian supplies."

British Columbia.

Chemical Industries.—At the Vernon plant of the B.C. Vinegar Works a 50,000-gallon tank system is being installed, a 3000-ton pasteuriser, a large hydraulic cider press and four new generators.

An amalgamation of four whaling companies has recently taken place under the name of the Consolidated Whaling Co., Ltd., capital $2,250,000. The firm produces whale oil and whale meat. The former is shipped in the company's own tank cars and the latter is being canned in increasing quantities.

The American Nitrogen Products Co., of Seattle, U.S.A., has incorporated a Canadian branch at Victoria, B.C., with a capitalisation of $2,000,000,

under the name of the American Nitrogen Products, Inc. Nitric acid will be manufactured by the arc process at a plant which is being erected on the north arm of Burrard Inlet near the Vancouver Power Co.'s new hydro-electric station. The initial plant will use 3500 K.W.H.

IRON AND COAL INDUSTRIES.—The Eburne Steel Co., Ltd., is experimenting on the electric smelting of native magnetite and hematite ores.

A company is being organised in Vancouver to carry out the recommendations of Dr. Stansfield, whom the Provincial Government employed to report on the best means of organising and operating a local iron and steel industry. It is proposed to erect a plant with a daily capacity of 50-100 tons.

The coal production of British Columbia for the first six months of 1918 was 1,375,000 tons, being 250,000 tons more than the output for the first half of 1917. Vancouver Island coal is now being used on a large scale by the United States Navy.

MINERAL RESOURCES.—Interesting discoveries of strontianite, chromite and fluorspar have recently been made at various points in the interior.

In addition to the discovery of manganese ore in the Cowichan Lake section, Vancouver Island, another deposit of considerable extent was recently found at Kaslo.

Sodium carbonate of 99 per cent. purity is being produced from the waters of Horseshoe Lake near Clinton, on the line of the Pacific Great Eastern Railway. A Vancouver syndicate is carrying on a systematic exploration for deposits of potash salts. Samples from a number of saline lakes have been examined and found to be mostly sodium sulphate.

As the result of Mr. C. Camsell's examination of the cinnabar deposits at Hardy Mountain, Kamloops, the Geological Survey proposes to instal a reduction plant. The cinnabar deposits on Vancouver Island will also be developed.

The Geological Survey, Ottawa, states that a deposit of natro-alunite occurs on Kyoquot Sound on the west coast of Vancouver Island; it covers an area of 4½ acres and contains about 600,000 tons, above the sea-level. The mineral constitutes 20—45 per cent of the mother rock, the remainder being mainly quartz. Analyses of two specimens, a pink to white variety and a bluish-grey variety gave in percentages:—SiO_2: 49·82 and 62·70; Al_2O_3: 19·08 and 12·68; FeS_2: nil and 2·69; Na_2O: 2·74 and 1·09; K_2O: 4·40 and 2·10; H_2O: 7·00 and 7·15.

The Dominion Government has reserved all deposits of guano found in northern Canada. One deposit on Pelican Island, Lake Miquelon, Alberta, is estimated to be worth $1,500,000.

GENERAL.

EXHIBITION OF BRITISH SCIENCE AND INVENTION.—In view of the wide public interest taken in the British Scientific Products Exhibition, held at King's College, London, during the past summer, the British Science Guild has decided to organise another exhibition next year, the main object of which will be to stimulate national enterprise by a display of the year's progress in British science, invention and industry. Further particulars of the exhibition will be available in due course. A large part of the recent exhibition has been transferred to Manchester, where it will be on view at the Municipal College of Technology towards the end of next month.

BRITISH ASSOCIATION OF CHEMISTS.—At a meeting of the Nottingham and Derby Section, held in Nottingham on November 13, Prof. F. S. Kipping presiding, Prof. J. W. Hinchley urged that the formation of the Association was a step in the interests of progress. The chemical industry would not get the chemists it wanted unless adequate salaries were offered. He eulogised much of the work of the Institute of Chemistry, but thought that it had failed on the economic side; moreover, its Charter prevented it from working in this direction. Chemists should accord their support both to the Institute and the Association, and he hoped that these two bodies would work in harmony. Dr. E. P. Hedley, secretary of the section, said that the president of the Institution of Electrical Engineers had stated publicly that an economic society was needed by the engineering profession, and that one was being fathered by his Institution.

PROPOSED SUBJECT GROUP FOR CHEMICAL APPARATUS.—At a sectional meeting of the Verein Deutscher Chemiker held in Berlin, the question of forming a subject group of the society for promoting the simplification and standardisation of chemical apparatus was discussed. The general opinion of the meeting appeared to be in favour of the proposal, and the view that the group should be extended to cover chemical plant in general also found support. Prof. Stock, who opened the discussion, emphasised the desirability of the direction of the proposed group being in scientific hands.—(*Z. angew. Chem., Sept.* 20, 1918.)

THE GERMAN CHEMICAL SOCIETY.—The fund raised in connexion with the Jubilee of the Deutsche Chemische Gesellschaft has now reached 2,602,417 marks (about £130,000). It has been resolved to call it the Baeyer Fund in memory of Adolf von Baeyer. The Society has recently been the recipient of a legacy of £1500, the interest of which is to be devoted to the promotion of physical-chemical investigations, preferably in the sphere of organic chemistry.—(*Z. angew. Chem., Oct.* 22, 1918.)

NEW PREPARATIONS OF SALVARSAN.—In a recent address to the Royal Institute of Therapy at Frankfort, Prof. Kolle, the successor of the late P. Ehrlich, announced that two new salvarsan preparations had been discovered, the one a silver-salvarsan and the other a stable soluble form. Their application will, it is thought, much improve the Ehrlich method of treatment.—(*Z. angew. Chem., Oct.* 11, 1918.)

PROPOSED CINCHONA CULTIVATION IN THE PHILIPPINE ISLANDS.—The introduction of cinchona plants into the Philippine Islands from India is being attempted by the Igorot Exchange, a missionary institution at Sagada, Island of Luzon. The seeds were sent in October last and reached their destination. According to the Director of the Bureau of Science, Manila, cinchona has not been cultivated in the Philippines before, but he is of opinion that the climatic and soil conditions of the mountain Province in which Sagada is situated are entirely adapted to its cultivation.—(*U.S. Com. Rep., Sept.* 26, 1918.)

CEMENT INDUSTRY IN NORWAY.—The three cement factories belonging to the Christiania Portland Cement Factory in South Norway are constructed with a view to producing 1·8 to 2 million barrels per annum. Partly owing to war difficulties, but chiefly from lack of demand, two of the factories have been working this year under restricted conditions. When all the three cement factories are working at full strength, the Norwegian cement industry will produce considerably more than the home market can dispose of. German, Danish, and Swedish cement factories also produce far more cement than is required for their respective home consumption.—(*Farmand, Sept.* 7, 1918.)

MOLYBDENITE MINING IN NORWAY.—The "Undalens Molybdenum Mines," formed in December, 1916, especially to secure and work veins in the Vest-Agdir district, has recently offered 1000 new shares at par (Kr. 1000). The present capital is Kr. 1,500,000. The majority of the shares may not, without special royal sanction, be owned by foreign interests, by anyone engaged in mining in Norway,

or by anyone owning a majority of shares in any other mining company in Norway.—(*Stavanger Aftenblad, Sept.* 24, 1918.)

MOLYBDENUM WORKS IN NORWAY.—A limited company has been formed in Haugesund, Norway, with a capital of 700,000 kroner, to erect molybdenum smelting works near Sandnes; it will be the first of its kind in Norway. It is estimated that the yearly capacity of the plant will be 50 tons of molybdenum ore, valued at 2,000,000 kroner.—(*U.S. Com. Rep., Sept.* 21, 1918.)

TUNGSTEN IN SWEDEN.—An important step has recently been taken towards making Sweden independent of foreign countries for her supplies of tungsten. Swedish wolfram deposits are to be exploited by the Stockholms Superfosfatfabriks A.B., which is now erecting an extraction plant, and further searches for ore are being made. Before the war Sweden's whole requirements of wolfram were imported, mainly from America. After the last consignment, imported in 1916, was exhausted, the industries concerned have been using molybdenum from native sources.—(*Iron and Coal Tr. Rev., Oct.* 25, 1918.)

OIL FROM ALUM SCHIST IN SWEDEN.—A factory, called the A/B Svenska Skifferverken, Lamma Nerika, Sweden, has been started for obtaining oil from alum schist; its capacity is 30,000 tons of schist per annum, from which 1200 tons of oil is expected to be produced. The supply of schist in Sweden is practically inexhaustible, and other similar factories will soon be built.—(*Teknisk Ukeblad, Aug.* 30, 1918.)

FUEL BRIQUETTES FROM SEAWEED.—A Danish company with a capital of Kr. 800,000 (krone = 1*s.* 1½*d.*) is in process of formation for the purpose of producing fuel briquettes from seaweed. The material is pressed by machinery into briquette form and rapidly dried at a high temperature. The fuel value is given as 4700 units, as compared with 2700 for peat and 5500 for gas coke. The cost of production is about one-half that of gas coke and not greater than that of peat. The process has been patented.—(*Rhein. West. Zeit., Aug.* 15, 1918.)

FRENCH SYNDICATES FOR IMPORTATION OF RAW MATERIALS.—Importation into France of many kinds of raw materials is being centralised in syndicates or consortiums under Government control. The following commodities, in addition to war materials, are among those dealt with: cotton, wool, jute, lumber, drugs, chemicals, fertilisers, tanning materials, dyes, glassware, lubricants, petroleum and benzine, oilseeds and nuts, hemp, perfume materials, soap-making materials, cooking paper and paper-making materials, vegetable fibres, stearin and colours for candles. The consortium is intended only as a war measure, and is designed to give the Government the fullest control over imports in the interests of the nation, whilst leaving as much initiative as possible to manufacturers. It is hoped that consortiums will prevent wasteful competition in markets which must supply also France's Allies, and eliminate profiteering by "mushroom" firms. Also that freight space will be most efficiently utilised, and that more effective control over exchange will be secured by reducing the number of individual importers; and further that a more equitable distribution of available materials will be secured by a system of rationing, the Government thus controlling prices and the uses to which goods are put. Finally, the French Government hopes to apply profits, after payment of 6 per cent. interest on invested capital, to the establishment of industrial and technical schools, to the endowment of research, and the encouragement of home manufacture of chemical products from French-colonial raw materials. It is anticipated that the *régime* of syndicates will foster the growth of a spirit of co-operation among French manufacturers.—(*U.S. Com. Rep., Sept.* 12, 1918.)

THE DESICCATION OF FOOD PRODUCTS.—According to the *Bulletin des Usines des Guerre* (Sept. 23, 1918), the number of plants used for drying food products in Germany increased from 900 in 1914 to 2400 in 1917. Most of the malt kilns are used for drying leaves of beet and other vegetables, potatoes, beetroots, etc., in order to preserve them and to diminish railway transport.

A new appliance for drying skimmed milk, whey, and eggs, has been in use for some time at Bucharest. One plant treats 15,000 eggs per hour, another 140,000 eggs per day, and four others are being erected. The principle is to bring the liquids in a state of fine division in contact with air at 100—120° C. The evaporation of water being very rapid, the temperature of the liquid falls almost immediately 45—50° C. From 18 kilos. of skimmed milk or whey, 1 kilo. of dried powder is obtained, which can be preserved for six months; the presence of fatty matter in whole milk shortens the period of preservation to two months.

The Krause process consists in atomising the liquid in a current of air at 100—120° C. by projecting it on to a horizontal plate turning at 100 revolutions per minute. The *Bulletin* does not state if the usual practice of reducing the water content by about 60 per cent. before desiccation is dispensed with or not.

CELLULOSE AS A SUBSTITUTE FOR FODDER.—It is reported from Malmö that after exhaustive tests lasting ten weeks it has been found that cellulose is a satisfactory substitute for fodder for cows, both from the point of view of milk production and of fattening. It has also been found that cellulose makes a suitable food for horses.—(*Norddeut. Allgem. Zeit., Sept.* 21, 1918.)

"TETRAPHOSPHATE" OF LIME.—The scarcity of superphosphate of lime has led to the commercial exploitation of the so-called "tetraphosphate" of lime or "Tetra" invented by Prof. Stoppani of Bologna in 1911. It is made by heating to 600—700° C. finely ground natural phosphate with 5—6 per cent. of a mixture of calcium, magnesium, and sodium carbonates. The calcined mass is moistened and then diluted with earth or sand until its content of phosphoric acid is reduced to about 20 per cent. According to the Canadian Trade Commissioner in Milan, the material is being manufactured in Italy at the rate of 50,000 metric tons per annum, and large plants are being erected near Luxor on the Nile and at Kosseir on the Red Sea. The Italian Ministry of Agriculture reports that it is equal to superphosphate in fertilising power, and that it has the advantage over the latter in being free from acidity and in being cheaper to produce. The French Government has recently sent an expert to Italy to investigate the process and to experiment. In an article in the *Bulletin de la Société d'Encouragement* (March-April), M. Hutier points out that the mode of manufacture seems to preclude the occurrence of chemical reaction between the ingredients, and asks if the results obtained are not due to the magnesia, lime and soda added. He deprecates further manufacture until this question has been answered. A writer in *Handel und Industrie* (No. 1396) takes the same view.

MICA IN THE U.S.A. IN 1917.—Mica is used in the form of sheet, splits, and ground mica. The smallest sheets should yield discs of at least 1¼ in. diameter or rectangular plates 1½ in. by 2 in. Sheet mica is used chiefly for electrical insulation, as a substitute for glass in masks, goggles, stoves and lamp chimneys and for phonograph diaphragms. "Splits" are sheets only 1/1000 in. thick which are built up into mica board and used for electrical purposes. Ground mica

is made into roofing material and treads on motor-tyres, and is used in annealing steel, in lubrication, for decorative purposes, and particularly for inlaid work in India. In 1917, 3853 short tons of mica of all qualities was produced and sold in the United States, this being rather more than in 1916, but less than for any preceding year since 1908, with a value of £150,000, whilst that of the 600 short tons of sheet mica included in this amount was £140,000. The average selling price of sheet mica in 1917 was 2*s.* 6*d.* per lb.; that for rough trimmed sheet mica cut to size varied from 4*s.* for sheets 2 in. by 3 in. to 20*s.* for sheets 6 in. by 8 in. Pieces about 1½ in. diameter realised 2¼*d.* to 1*s.* 8*d.* per lb.

Almost the whole of the mica produced in the U.S.A. came from North Carolina and New Hampshire. Of the mica imported into U.S.A. in 1917, 53 per cent. came from India, 38 per cent. from Canada, and 9 per cent. from Brazil and Argentina. The manufactured mica exported had an estimated value of £14,000.

In Central America, a considerable amount of prospecting for mica was done in Guatemala, and several prospectors are endeavouring to develop their properties, but owing to the difficulty of procuring labour and explosives, little mica has been produced. Several shipments have, however, been sent to Boston and New York and one to London. In 1916 and 1917 about 6 tons of mica were exported from Baja Verapaz to New York.

In Argentina, a firm in Buenos Ayres was prepared (in 1917) to export sheet mica of good quality in quantities of about 5 tons per month at prices varying (according to the size of the sheets) from 1*s.* 6*d.* to 7*s.* 6*d.* per lb. and very slightly lower than those current in the United States at that time. Several hundred pounds of mica were imported from Peru in 1917. It is significant that India furnished two-thirds of the world's supply of mica in 1916, the figures being 2170 tons supplied by India, 433 tons by the United States, 604 tons by Canada, and 38 tons by other countries.—(*U.S. Geol. Surv.*, 1918.)

Phosphate Fertilisers During the War.—The following table shows (in metric tons) the exports of phosphate fertilisers from the United States and Northern Africa (Algeria, Tunis, Egypt) from 1913—1917, inclusive :—

	U.S.A.	North Africa
1913	1,366,508	2,487,664
1914	964,114	1,868,874
1915	253,421	1,373,145
1916	243,678	1,435,475
1917	166,003	651,800*

* For Egypt and Tunis only.

The next table gives the imports into certain allied countries during the same period :—

	Italy	France	Great Britain
1913	529,776	940,791	547,666
1914	513,998	661,429	571,264
1915	456,901	325,762	380,651
1916	431,425	285,906	338,721
1917	489,000	?	495,000

The production of superphosphates was as follows :—

	Italy	France	Great Britain
1913	972,317	1,000,000	820,000
1914	924,736	1,600,000	?
1915	912,240	600,000	685,000
1916	867,690	350,000	631,500
1917	489,000	?	490,000

—(*Epoca*, *Oct.* 8, 1918.)

Magnesite in the U.S.A. in 1917.—Magnesite is used in the United States for the manufacture of refractory bricks (chiefly in California and in the eastern and central States), for Sorel cement (used chiefly for sanitary flooring in combination with wood flour, cork, talc, silica and asbestos), in the manufacture of paper from wood pulp (magnesium bisulphate having a more solvent action than calcium bisulphate on the free resins), in the production of carbon dioxide gas for magnesia paint, boiler coverings, and for medicinal purposes. Prior to 1915 about 300,000 tons of magnesite was imported annually, but since that time deposits in California and those opened up in Steven's County, Washington, in December, 1916, have been able to supply the whole of the American market. The Washington deposits have been estimated to contain over 2 million tons in two properties alone. In 1917 the crude magnesite produced in the U.S.A. was 316,939 short tons—practically double that of the previous year—of which California produced about two-thirds and Steven's County the bulk of the remainder.

The magnesium compounds imported during 1917 included 26,000 tons of crude magnesite from Canada and Greece, 3500 tons of calcined magnesite from Canada, and about 70 tons of caustic magnesia, magnesium carbonate and Epsom salts from the United Kingdom.

The average price of the crude magnesite at the mine in California in 1917 was 42*s.* per ton, the calcined magnesite being sold at £6—£10 per ton according to quality.

The Californian magnesite is less suitable than that from Steven's County for refractory purposes as the latter contains rather more iron which acts as a useful binder and produces stronger bricks. The production of metallic magnesium is a well-established industry: the output in 1917 was 115,800 lb. Light magnesia is chiefly made from dolomite in Pennsylvania.—(*U.S. Geol. Surv., July*, 1918.)

Chromium and Manganese Ores in Cuba.—The U.S. Geological Survey estimates the total reserves of marketable chrome ore in the Cuban range at 90,000 to 170,000 tons, but the 1918 export will not exceed 2000 tons unless special efforts are made. The largest deposits are near the north-east coast of Oriente in a region difficult of access.

Great interest is being taken in the manganese mines and the 1918 output should reach 120,000 tons, the bulk of which will assay 36—45 per cent. manganese. Transport facilities are being improved and a higher output is expected in 1919. The reserves of manganese ore in Oriente are estimated at about 800,000 tons.—(*Bd. of Trade J., Nov.* 7, 1918.)

Iron Ore Deposits of Brazil.—Oligistic (micaceous) iron ore is found in large masses in Brazil, the deposits extending for hundreds of miles. The ores occur in numerous varieties, of varying composition, being often of high grade, but nearly always containing sulphur and phosphorus. The most important mines, both as regards extent and metal content, are those in the States of Matto Grosso, Goyaz, and Minas Geraes. Magnetite ores are also found, but, generally speaking, the deposits are of limited extent, and they are often titaniferous. All the ores are stated to be high grade and of exceptional purity. The deposits often form outcrops, thus making their mining easy: at Pitanguy the ore can be traced for a width of about 200 yards for many miles. In many places iron-bearing rocks form the beds of rivers, and the detritus carried by them constitutes ready washed ore that can be taken direct to the blast furnaces.

Prof. Gorceix has estimated the iron ore masses surrounding the Serra do Caraça at 8,000,000,000 tons, and Dr. Gonzaga de Campos estimates the extent of the area comprising the iron deposits in Central Minas at about 2200 square miles. A large proportion of the best iron-bearing districts of Central Brazil have been acquired by British interests.—(*Iron and Coal Tr. Rev., Oct.* 4, 1918.)

Coal and Lignite Production in Holland.—The war has caused a great increase in the Dutch home production of coal, lignite and peat. The coal output has risen from 1,873,000 metric tons in 1913 to 3,079,000 tons in 1917, and the estimated figure for the present year is 3,500,000 tons. There has been a general increase in the production of all the mines of from 15—20 per cent.; but the State mine Emma is responsible for the greatest increase. This mine, which had barely any output in 1913, is now turning out 60,000 tons per month, and is expected to produce at the rate of 1,000,000 tons per annum by the end of 1919. In addition to a scarcity of food, many difficulties have been encountered in obtaining mining requisites. Liquid oxygen is being used successfully in place of dynamite, and mine cables and pit props are now being supplied from home sources. The price of coal was 10 florins per ton in 1914 and in 1917 rose to twice that figure. The high price and the excess of demand over supply have formed the chief incentives to increased production. One factor which had to be fought was the prejudice in Holland against Limburg coal. Before the war the competition of the Rhenish Westphalian Coal Syndicate killed the home demand for Dutch coal, the bulk of which was exported to Belgium and Northern France.

The lignite deposits were not worked to any extent till 1917. Since then over $2\frac{1}{2}$ million florins have been invested in lignite enterprises, and the growth of output has been phenomenal. The deposits are adjacent to the Limburg coalfield, and are being worked chiefly by two companies—the Bergerode and the Carisborg; each of these is now producing about 80,000 tons per month, and the total output for 1918 is forecasted at 1,300,000 tons.

The total fuel production of the country for 1918 including coal, lignite and peat is expected to be equivalent to 5,000,000 tons of coal, whereas the estimated consumption is about 6,500,000 tons.—(*Bd. of Trade J., Oct.* 31, 1918.)

Tar Oils for Impregnating Wood.—The German Ministry of Public Works has carried out experiments on the impregnation of wood with tar oils, which point to highly satisfactory results when the process is properly conducted. It requires special boilers and machinery, which cannot be transported to the place where the wood is to be used, and the transport of the wood entails loss of time and expense. The working of the wood after treatment is difficult as the oil is corrosive. The process greatly increases the life of all timbers. Piles which had been treated and then driven in water retained the greater part of the oil in their pores after thirteen years. The tensile strength of untreated dry timber is always greater than that of untreated wet timber, and as the impregnation process drives out moisture the tensile strength of the treated wood is greater than that of the untreated timber.—(*Gas J., Sept.* 24, 1918.)

Vegetable Oils in Japan.—Owing to greatly increased demand during the past two years, the Kobe soya-bean and coconut oil mills have been very prosperous. The present output of Japan is 223,500 cases (7550 long tons) of oil per month, divided thus: soya-bean oil, 92,500 cases; coconut, 68,000; rapeseed, 44,000; cottonseed, 16,000; peanut, 3000.

There are 25 large vegetable-oil mills in the Kobe district, producing 75 per cent. of the Japanese output. Three types of pressure-mill are employed; the round type, the oblong flat-bed type, and the bowl type. The Kashiwara mill uses the latest American rotary screw oil-expressor. Clay filter presses are employed when filtering is necessary. Existing mills are being enlarged and new ones built to meet the demand for oil, and American or Japanese-American cottonseed oil machinery is being installed.—(*U.S. Com. Rep., Sept.* 4, 1918.)

Cultivation of Oleaginous Plants in Germany.—In 1913 the areas in Germany under oleaginous and textile plants were respectively 34,000 and 17,000 hectares (84,000 and 42,000 acres); in 1917 the corresponding figures were 82,000 and 33,000 hectares (202,625 and 81,550 acres). Want of space, risk, varying climatic conditions and lack of expert knowledge by agriculturists militate against further increase. Agriculturists are allowed to retain a proportion of the oil seeds they cultivate.

The oil is to be worked up into margarine for general use by the addition of bone extract, other vegetable substances, and water. The War Committee for Oils and Fats promotes the cultivation of oleaginous plants by making contracts and supplying fertilisers.—(*U.S. Com. Rep., Sept.* 13, 1918.)

New Professorship of Chemistry at Geneva University.—The Municipality of Geneva has resolved to found extra-ordinary professorships for technical chemistry and special physics at the University.—(*Z. angew. Chem., Oct.* 18, 1918.)

LEGAL INTELLIGENCE.

Carbonate of Magnesia Contract Dispute. *A. Harding and Co., Ltd., v. G. F. Berry.*

An appeal from a judgment of Mr. Justice Bailhache in favour of the defendant (this J., 1918, 250 R) was heard in the Court of Appeal on November 5. Lord Justice Bankes, in giving judgment, said there seemed to have been a slip in the sense that the case was stopped before a material fact had been proved on the defendant's part. The latter's case depended upon establishing that the contract sample was part of the general manufacture of the company whose manufacture was analysed by their own analyst. The defendant was proceeding with his case and would have called the necessary witness, Mr. Berry, to give evidence, but the learned judge intervened and said that the plaintiffs' analyst was wrong and the defendant's analyst right. That did not dispose of the case unless the identity of the particular sample had been established. His Lordship allowed the appeal and ordered a new trial, with the ordinary consequences as to costs. Lords Justices Bankes and Scrutton concurred.

Starch and Corn Syrup Contract Case. *Manbré Saccharine Co., Ltd., v. Corn Products Co., Ltd.*

In the King's Bench Division, on November 15, Mr. Justice McCardie gave judgment in an action brought by plaintiffs to recover damages for breach by defendants to deliver the balances owing on two contracts in 1916 for the delivery of American pearl starch and Globe Crystal corn syrup. Although plaintiffs asked for delivery of the balance, defendants failed to deliver but tendered documents later which plaintiffs refused, alleging they were not a valid tender. The documents included no policy of insurance.

His Lordship said that plaintiffs were clearly entitled to a policy and not to mere assertions by defendants that a policy existed and that the defendants would hold the plaintiffs covered. Even if defendants had tendered the policies they held, his Lordship would have held the tender bad, for they covered a quantity of goods outside those mentioned in the bills of lading and invoices sent to the plaintiffs. Under the circumstances plaintiffs were entitled to succeed, and there would be judgment for them for the sum of £5262 and costs.

[Fuller reports of the above cases may be inspected at the Society's offices (Editorial Dept.).]

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Subsidies in the Iron Industry.

Mr. Kellaway, answering Mr. Holt, said that subsidies are being granted to iron and steel manufacturers to compensate for the increased cost of production. Up to July last subsidies amounting to £47,000,000 had been approved, and since then increases had been granted to cover further rises in the cost of coal and rates of wages. (Nov. 7.)

Cellulose Acetate (Inquiry).

In reply to Mr. Dillon, Mr. Bonar Law stated that he was not aware of any delay on the part of the British Cellulose Inquiry Committee (this J., 1918, 300 R). It has been found necessary to examine a large number of documents and time has had to be granted to prepare statements and evidence. It has been decided for the present to take evidence in private. (Nov. 12.)

Demobilisation and Transition.

In Committee of Supply, the Minister of Reconstruction, Dr. Addison, said that his Department would submit definite proposals with regard to health, housing, working conditions, utilisation of water power, transport services, and the land. At the present moment special attention was being directed to emergency legislation with reference to the transition (armistice) period. The Ministry of Munitions had reported that 70 per cent. of the men and 40 per cent. of the women in the metal and chemical trades were engaged on work for which there will be a post-war demand. In other words, there will be about one million people in these trades who will be required to change their occupations. A special committee has been formed to provide demobilisation machinery on the civil side, and the Ministry of Labour had set up 260 local advisory committees to help in demobilisation and resettlement work. To tide over this anxious period a non-contributory unemployment scheme had been devised applying to those who become unemployed owing to the cessation of war contracts. The scheme for civilian workers will be in operation for six months and the maximum period of assistance will be thirteen weeks, and for demobilised soldiers, for one year with a maximum period of twenty-six weeks. The demobilisation of men with the Colours will be managed by the War Office, but its order will be undertaken by the Ministry of Labour. In the case of men who at the time of joining up had not completed their apprenticeship, the State will make a contribution to bring their wages up to the level they would normally have attained provided the employer grants facilities for an intensive form of apprenticeship. Permanent appointments in the Civil Service will be renewed for ex-officers and ex-soldiers for one year from the beginning of demobilisation: and a scheme will be provided for furthering the continued training of young ex-officers and ex-soldiers whose education was interrupted by the war. The Civil Liabilities Department will continue to give assistance in certain circumstances to officers and men who, by reason of the war, are unable to meet their financial obligations. The Ministry of Munitions, converted into a Ministry of Supply, will undertake the demobilisation of surplus stores, the value of which in the hands of the War Department is about £500,000,000. An attempt made in February last to ascertain from manufacturers the probable post-war demands for materials was unsatisfactory owing to the uncertainty of prices, etc. With regard to iron and steel, arrangements are being made to allow of the importation of as large a quantity of foreign ore as was imported before the war. Iron and steel will be released forthwith. There is a sufficient supply of non-ferrous metals to admit of some supplies being released immediately, and the remainder within a few months. Arrangements have been made for effecting the easy transfer from war to peace conditions with regard to wool, jute, flax, and hemp. The position as regards timber is one of the most difficult, and it will be necessary to continue felling for at least another twelve months. Arrangements are being made in respect of the disposal of the many State-owned and State-controlled factories. There are great opportunities ahead for foreign trade: but our efforts will be in vain unless we have industrial peace in the country. (Nov. 12.)

Department of Oils and Fats.

Major Astor, replying to Col. Thorne for the Food Controller, said the annual turnover of the above Department was £70,000,000, and that the total profit for the first three months of this year was £886,771. (Nov. 14.)

Coal Conservation and Electric Power Supply.

The President of the Board of Trade stated in reply to Sir J. D. Rees, that he fully realised the importance of giving effect to the Reports of the Coal Conservation Sub-Committee to the Ministry of Reconstruction and of the Electric Power Committee to the Board of Trade, and he hoped to be able to place before Parliament proposals for legislation with the least possible delay. (Nov. 14.)

Patent-Still Spirit.

Mr. Kellaway, in a written reply to Mr. G. Terrell, stated that the patent-still spirit produced in the yeast-making distilleries is being taken by the Government, but not spirit required for industrial purposes. The purpose to which it is to be applied is now under consideration. The quantity in warehouse on November 14 was about 3,450,000 proof gallons, and the average monthly production is slightly over 2,000,000 gallons. (Nov. 18.)

Ministry of Munitions Bill.

In moving the second reading of this Bill, Mr. Kellaway explained that its object was to empower the Ministry to continue its activities, but in the direction of reconstruction. The demand for peace production in regard to building materials, fertilisers and agricultural implements greatly exceeded the supply. There was no desire to continue any existing Order a moment longer than was necessary, but in the interests of order it was essential that the Ministry should persist for some little time. Sir W. Pearce regretted the intention to continue the hampering conditions inherent to Government control of industry, and particularly of the chemical industry; he feared the consequences which might result, and thought that previous notice and information should have been given. Mr. J. W. Wilson also strongly regretted that the Bill should have been introduced as late as the last day of the Session. The Bill was read a second time, passed through Committee and read a third time. (Nov. 19.)

Grain Alcohol.

Mr. Kellaway informed Mr. Watt that a quantity of grain alcohol was to be released immediately. The release will not affect the amount available for drinking. (Nov. 20.)

At the prorogation of Parliament on November 21, it was announced that the Petroleum (Production) Act, 1918, and the Ministry of Munitions Act, 1918, had received the Royal Assent.

REPORT.

SULPHATE OF AMMONIA ASSOCIATION.

The fourth annual report states that under the arrangements by which all sales of sulphate of ammonia for export and for munitions purposes were placed in the Association's hands, a quantity of 49,419 tons was sold and a total surplus of about £76,400 realised and distributed in accordance with the terms of the Equalisation Scheme, this sum representing £70,100 on 27,600 tons delivered for export, and £6300 on 21,800 tons for munitions. For the coming year the Ministry of Munitions has decided to place all industrial sales in the hands of the Association, and the surplus will be pooled among all makers in proportion to their production.

The Makers' Sub-Committee of the Sulphate of Ammonia Distribution Committee conducted the negotiations with the Ministry of Munitions and the Food Production Department in order to obtain an advance in the fixed price for the season 1918-19; an increase of £2 7*s.* 6*d.* per ton on the 1917 price was secured, together with guarantees against further increase in the cost of acid and bags. The subsequent decision of the War Cabinet to maintain prices to the farmer at the 1917 level came as a surprise to makers. There is little doubt that farmers could and would have paid a much higher price for sulphate if not for superphosphate; but in war time no risks in regard to Food Production should be taken, and the Association cannot quarrel with a decision which gives sulphate a valuable advertisement.

Throughout last year the Association was employed by the Food Production Department in arranging the distribution of sulphate of ammonia for agricultural purposes. From October, 1917, onwards the Association took practical control and agricultural orders for about 130,000 tons were placed with makers. The total deliveries for home agriculture were 238,000 tons; the comparative figures for the two previous seasons were 150,000 and 62,000 tons respectively. For the coming year the provisions of the Fertiliser Prices Order, 1918, govern all transactions in sulphate of ammonia for home use. The main object of the Order is to secure the most economical distribution possible as far as freight and use of trucks are concerned, and the almost complete control which it gives to the Distributing Body should serve to secure this object. In view of the experience gained last year, however, the extension of bureaucratic control over sulphate of ammonia is a matter for some regret. The Manager of the Association has been appointed Joint Secretary of the official Fertilisers Allocation Committee, set up by the Boards of Agriculture for England, Scotland and Ireland. This Committee controls the distribution of the entire production of sulphate of ammonia, basic slag, superphosphate and potash.

Under the Fertiliser Prices Order the maker of sulphate of ammonia containing less than 0·025 per cent. of free acid is entitled to charge 5*s.* per ton extra. This official recognition of the value of better quality has resulted in further experiments being made with a view to producing neutral salt. The Association issued a circular giving full particulars of the "Adam Process" now in operation at the works of the Gas Light and Coke Company. The salt produced is superior to any sulphate of ammonia previously placed on the market in Europe, and it is to be hoped that the great majority of makers in the country will be producing neutral sulphate by the time export on a large scale is again possible. The question of quality is, however, equally important as a means of retaining the home market, and in this connexion a remark at the end of the final judges' report of the competition is illuminating: "In the course of our visits to the competitors two points have specially struck us—firstly, the universal praise bestowed upon the salt supplied by the South Metropolitan Gas Company, and, secondly, the good quality and uniform appearance of the bags which are being supplied this year." The sulphate produced by the South Metropolitan Gas Co. was the nearest approach to neutral salt available at the time, and it is interesting to note that this Company has expressed its intention still further to improve the make with a view to eliminating the free acid altogether.

A proposal will shortly come before members for consideration as to the formation of a Sulphate of Ammonia Trading Company, to be owned and controlled entirely by makers of sulphate of ammonia. Its object would be to relieve the individual maker of the responsibilities and risks of seeking his own market, while at the same time guaranteeing to him the market price, both at home and abroad, and free disposal of his production. It is felt that such a company, if supported by the large majority of makers, would be in a position to take the necessary steps to retain and expand the home market, and to take the fullest possible advantage of the opportunities afforded by the export market.

GOVERNMENT ORDERS AND NOTICES.

PROHIBITED EXPORTS.

The Board of Trade has announced many relaxations of the export prohibitions hitherto in force. The following is a list of chemicals, etc., affected. It should be noted that the export of materials on List A is prohibited to all destinations, of those on List B to all destinations outside the British Empire, and of those on List C only to countries which border upon enemy countries.

Headings to be transferred en bloc from one list to another.

From List A to List B:—

Cutch and extracts thereof; aconite root; aloes; amidol and mixtures containing; araroba or Goa powder; belladonna and its preparations; belladonna alkaloids and their salts and preparations; caffeine and its salts; Calabar beans; carbon disulphide; catechu; chlorates, all metallic (except potassium chlorate); chromium acetate; chromium chlorate; chromium nitrate; chrysarobin; chiretta; cotton wool and articles containing; cubebs; cylinders, metal, capable of use for the storage of gases or liquids under pressure; damiana; diethylbarbituric acid (veronal) and veronal sodium; emetine and its salts; fustic; gelsemium root; gentian root; ipecacuanha root; jaborandi leaves; nickel nitrate; quassia wood; rhatany root; rhubarb, medicinal; salt, other than rock salt; sodium prussiates and mixtures containing.

From List A to List C:—

Acetate of lime; acetones and their compounds and preparations; agar agar; alcohol absolute; alcohol ethylic, mixtures and preparations containing (not otherwise prohibited); alcohol methylic and its esters; amyl alcohol; anthracene oil and mixtures and preparations containing; balsams (except tolu balsam); bismuth nitrate; bleaching powder; carbolic acid and compounds thereof, and preparations containing; carbon tetrachloride and its preparations; cerium and its alloys (except ferro-cerium); chloroform; coal tar; cobalt nitrate; coca leaves and their preparations; collodion; copper acetate and nitrate; creosote, creosote oils, and mixtures and preparations containing; cresol, compounds and preparations of cresol and nitro-cresol (except meta-cresol

and para-cresol); cyanamide; diatomite; ether, acetic, formic, and sulphuric; electrodes, carbon, for electric furnaces; eucaine hydrochloride, eucaine (benzamine) lactate, and their preparations; explosives, industrial; ferro-molybdenum; fireclay, and articles wholly manufactured of fireclay, including firebricks; glycerin, and preparations containing, not otherwise specifically prohibited; green oil and mixtures and preparations containing; hydrocyanic (prussic) acid and solutions thereof; iodoform; logwood (chips, extract and preparations); manna; mantles, incandescent; mercury, compounds of mercury, and mixtures and preparations containing mercury or its compounds; naphthalene and its compounds and preparations; nitrates, all metallic (not otherwise prohibited); nitric acid; nitrol-toluol; novocain and its preparations; oil, blast furnace; paraldehyde; perchlorates, all metallic (not otherwise prohibited); phenacetin and its preparations; phosphorus (but not compounds of); picric acid and its components; pyridine; quercitron bark and extracts thereof; raffia; rock salt; soda, caustic, and mixtures containing; sodium bicarbonate in all forms, including sesqui-carbonate and mixtures containing any of these substances (but not soda crystals); sodium cyanide, and mixtures containing; spent oxide; spirits, methylated, and mixtures containing; spirits of a strength of not less than 43° above proof; strontium compounds and mixtures containing; sulphur and preparations containing; sulphur, chlorides of; sulphur dioxide liquefied; sulphuric acid and mixtures containing; sulphuric acid, fuming (oleum); tantalum, its alloys and ores; tar, wood; terebene and articles containing; tin, chlorides of; titanium compounds; toluol and its compounds and preparations; xylol and its compounds and preparations; zirconium and its alloys.

From List B to List C:—

Aluminium, oxides of, and mixtures containing aluminium oxides; aluminium sulphate; aluminoferric; alunite; arsenical ore; arsenic, compounds of arsenic, and mixtures containing; cerium, oxide and salts of; chlorine; citrates, not otherwise prohibited; cobalt, oxides and salts of and mixtures containing; copper iodide; copper suboxide and mixtures containing; crucibles, plumbago; ferro-chrome; graphite and mixtures containing; hydrochloric acid; iridium compounds; mica waste, mica powder, micanite, and articles made therefrom; molybdic acid and its salts; nux vomica, preparations of; oil, wood tar; osmium compounds; palladium compounds; rhodium compounds; ruthenium compounds; salicylic acid and its preparations; sodium; sodium bicarbonate; sodium salicylate and its preparations; sodium sulphide; theobromine sodium salicylate; tungsten compounds; urea and its compounds; zinc chloride and sulphate and mixtures containing; zirconium minerals.

Altered Headings.

(A) Aerated and mineral waters except unsweetened mineral waters; (C) unsweetened mineral waters; (A) aluminium and alloys of aluminium; (C) manufactures of aluminium or of its alloys; (A) coal tar, all products obtainable from and derivatives thereof (except solvent naphtha) suitable for use in the manufacture of dyes and explosives, whether obtained from coal tar or other sources, and mixtures and preparations containing such products or derivatives; (C) solvent naphtha; (A) glue, osseine, and concentrated size (and other sizes and sizings made from glue), fishglue, finings and other kinds of gelatine; (C) isinglass (not including gelatine); (A) nickel, its ores and alloys; (C) manufactures of nickel and its alloys; (A) paraffin wax; (C) mixtures and preparations of paraffin wax; (A) resins, resinous gums and resinous substances (except such as contain caoutchouc, and except the following, which are on List C:—gum ammoniacum, gum caramania (hog gum), gum galbanum, gum gamboge, guaiacum resin, Indian gum (gum ghatti), jalap resin, kaladana resin, gum olibanum, podophyllum resin, Indian podophyllum resin, gum sagapenum, gum thus, and articles containing resins, etc.); (B) salt other than rock salt; (C) rock salt.

The regulations governing the exportation of samples of prohibited goods (this J., 1918, 60 R) have also been revised.

PROHIBITED IMPORTS.

The importation of the following articles is prohibited, with the object of saving tonnage:—

Aerated mineral and table waters (unsweetened); aluminium, manufactures of; aluminium powder; cement; cocoa, raw; diatomite; fatty acids; incandescent gas mantles; ivory, vegetable; methyl alcohol; nuts; salt; sugar cane.

By a Proclamation dated November 8, the importation of oleo stearin and tallow, and olive oil was prohibited, except under licence.

A General Licence has been issued to permit the unrestricted importation of soap. In the case of the United States a "permit to purchase" is still required.

THE QUININE (DEALINGS) ORDER, 1918.

The Army Council has issued an Order, under date November 7, fixing maximum prices (detailed in a schedule) for sulphate of quinine, prohibiting dealings in quantities exceeding 1000 oz., and ordering all holders of stocks of quinine or quinine sulphate to furnish returns as and when required.

OTHER ORDERS.

The Petroleum Products (Wholesale Prices) No. 3 Order, 1918. Board of Trade, Nov. 5.

The Sulphuric Acid (Amendment of Prices) No. 2 Order, 1918. Ministry of Munitions, Nov. 8 (see this J., 1918, 421 R).

The Electricity (Restriction of New Supply) Order, 1918. Ministry of Munitions, Nov. 8.

The Railway Wagons Disposal (England and Wales) Order, 1918. Board of Trade, Nov. 9.

The Ex-Munition Workers Employment Order, 1918. Ministry of Munitions, Nov. 9.

The Refractory Materials (Maximum Prices) Order, 1918. Ministry of Munitions, Nov. 19.

Relaxation of Restrictions in the Metal Industry. The Minister of Munitions gave notice on November 13 that orders and instructions are in course of preparation under which the restrictions which have hitherto existed prohibiting manufacturers from undertaking certain classes of orders and from using certain materials otherwise than for specified purposes, will be relaxed so far as possible. In the meantime manufacturers are at liberty, subject to the existing Priority of Work Order, forthwith to use in manufacture, whether for stock or otherwise, any iron, steel or non-ferrous metals which they have already acquired by purchase and have in stock, and, subject to any existing restriction as to price, to accept any orders for manufacture out of such iron, steel or non-ferrous metals.

Export Prices of Steel.—The Minister of Munitions gives notice that all deliveries of steel for export shall continue to be made at prices fixed by the Minister. Information as to the export prices ruling on and after November 18, 1918, will be obtainable on application to the Ministry of Munitions (Controller of Iron and Steel Production), Whitehall Place, S.W. 1.

TRADE NOTES.

BRITISH.

British Industries Fair, 1919.—This fair will be held again next year in London; there will be no specific exhibit of chemical products, but glass and pottery will be represented.

Government Purchase of Chilean Nitrate.—A White Paper was issued on November 14 giving details of the agreement between the Chilean Government and the Nitrate of Soda Executive acting on behalf of the Associated Governments, concerning the sale by the former to the latter of 15 million quintals (680,000 tons) of nitrate at 13*s.* 6*d.* for refined and 13*s.* for ordinary (see this J., 1918, 349 R). The vendors are to pay the export duty. The Chilean Government cannot yet give a definite reply to the request of the Associated Governments for an option on the total nitrate production in Chile during 1919, but negotiations will be continued.

FOREIGN.

Saccharin Production in Austria.—The Oderberger Chemical Works (founded by the original firm of Fahlberg and List in Magdeburg) has raised its capital from 4 to 5½ million kroner. This company manufactures for the Austrian Monopoly Administration.—(*Z. angew. Chem., Oct.* 22, 1918.)

Coal and Peat-fibre in Norway.—A company has been formed with a capital of 4 million kroner to exploit the coal deposits in the Bjoerne islands, north of Norway. The "Norsk Torvtekzil" company has been formed to prepare peat-fibre. The process to be used is that of Prof. Sellergrens which yields a residue affording a litter which is superior to ordinary peat moss litter.—(*Z. angew. Chem., Sept.* 10, 1918.)

Proposed Sugar Industry in Finland.—The Government of Finland has undertaken to purchase from the sugar factories about to be erected a maximum of 6000 tons per annum of raw sugar, until 1922. The price of 10 Finnish marks (=about 10 francs) per kilo. has been fixed for 1919; thereafter a maximum price of 8 Finnish marks. A company with a capital of 5 million marks has been formed for cultivating the sugar beet.—(*Z. angew. Chem., Oct.* 8, 1918.)

Japanese Fertiliser Industry.—The Japanese Department of Agriculture and Commerce reports that at the end of 1916 there were 24,335 factories manufacturing fertilisers, 45,470 dealers, and 1100 importers. The amount of fertilisers produced was valued at 61,111,914 yen, including 12,895,735 yen of compound fertilisers, 9,483,988 yen of animal fertilisers, 18,805,280 yen of mineral fertilisers, and 85,703 yen of miscellaneous goods. Imported fertilisers were valued at 34,699,740 yen (yen=2*s.* 0½*d.*). —(*U.S. Com. Rep., Aug.* 22, 1918.)

Chemical Trade of French Indo-China.—In 1916 there were imported into Saigon chemicals to the value of £47,047, of which £35,628 worth came from France and £8481 worth from Hongkong. In 1917 this importation fell off to £27,936, of which amount £12,076 worth were shipped from Hongkong and £9521 worth from France. The principal heavy chemicals used are copper and iron sulphates, which are employed in the rubber industry. Washing soda and laundry chemicals are also in demand. —(*U.S. Com. Rep., Sept.* 3, 1918.)

Soda Manufacture in Tientsin.—It is reported that leading Chinese merchants in Tientsin are forming a company to manufacture soda, natural salts being abundant in the Province of Chihli. It is calculated that at the present high price of imported soda the proposed factory, the cost of which is estimated at \$300,000, can show a profit of \$650,000 a year, or over twice the cost of the plant.—(*U.S. Com. Rep., Sept.* 11, 1918.)

Swatow (China) in 1917.—The trade of this district experienced a big decline in 1917, mainly owing to political disturbances. Imports included the following items of chemical interest:—20,309 tons of cement; 7,481 tons of chemical products; 519,947 tons of coal; 225,600 lb. of glue; 312,571 gross of Japanese matches; 265 lb. of opium; cosmetics valued at £6,000; 281,332 lb. of soda; 552,626 gallons of spirits of wine; 8,267,336 lb. of sugar, and 301,068 lb. of paraffin wax. The dyes and paints imported included 901,468 lb. of mangrove bark, 2,932 lb. of cinnabar, 197,468 lb. of Sapan wood, 16,268 lb. of vermilion, 215,868 lb. of paints and paint oil, and 1,661,868 lb. of other dyes and paints.

Mining has become an important industry since the discovery of wolfram ore near Swabue last summer. Since then, the ore has been found in other districts, and thousands of Chinese are digging for the valuable mineral.

The exports included:—White alum 646,933 lb., camphor 3200 lb., fireworks 500,400 lb., ginger 447,867 lb., liquid indigo 6,712,400 lb., wolfram ore 38,933 lb., other minerals 989,333 lb., potash 68,000 lb., resin 435,067 lb., rape seed 594,400 lb., sesamum 230,267 lb., other seeds 39,067 lb., brown sugar 52,297,467 lb., and white sugar 16,792,000 lb.

The chief features in the list are the decrease in indigo exports of 4,000,000 lb., mainly owing to increased local consumption, and the increase of 17,000,000 lb. in the exports of sugar.—(*U.S. Com. Rep. Supp., July* 31, 1918.)

The Combine of Swiss Dye Manufacturers.—Further particulars are to hand of the impending fusion of interests between the Society for Chemical Industry in Basel, the I.R. Geigy Co. and the Sandor Chemical Works (this J., 1918, 385 R). The first-named of these companies is to receive 52 per cent. of the profits, and the two latter 48 per cent. The agreement is to hold for 50 years, *i.e.* until 1968, after which, in default of notice, it may be continued for another 19 years. The companies must mutually agree on questions involving new capital issues, amalgamations, new business, or the installation of new buildings. Increases of capital, proposed by the directors, must be ratified at a general meeting. The dividends on the prior charges are to be raised from 4 to 5 per cent.—(*Z. angew. Chem., Oct.* 8, 15, 1918.)

Foreign Markets for Dyes.

Aden.—The Aden Port Trust return imports of dyes under four headings and the following list gives the figures for pre-war imports (1913-14), immediately followed by those for 1916-17:—Aniline, 719·5 cwt., nil; synthetic indigo, 1429·2 cwt., 14 cwt.; saffron, 0·5 cwt., 5 cwt.; all other (principally lac dye), 5979 cwt., 2198 cwt.

The aniline dye formerly sold was almost entirely of a red shade, selling at 30 cents. per lb., and supplied in half-pound and pound tins. Indigo blue was also sold in small tins at \$0·49 per lb. The lac is imported from India and was being replaced to some extent by German products.

China.—The value of aniline dyes imported into Swatow in 1913 was \$50,377 and of synthetic indigo \$109,215. These were put up in tin cans holding one catty (1⅓ lb.).

Morocco.—The aniline dyes imported into this country were mainly used for dyeing silk and woollen thread and native leather. Before the war (in 1913) the trade was distributed as follows:—France 670 lb., England 1212 lb., Germany, 28,293 lb., Belgium 3086 lb., Austria 882 lb., Nether-

lands 2502 lb. The colours in principal demand are fuchsine, orange, violet, poppy colour and blue. These were of such a character, or so made up, that they required simply to be mixed with water, no acids, salts or other chemicals being required.

Straits Settlements.—There is a good market in British Malaya for the sale of dyes, and the trade is mainly in the hands of the Chinese. The dyeing methods used are very crude, native products from mangrove bark and banana peels being mixed with the European products, the results being very uncertain. Manufacturers in one of the European countries which largely supplied the Straits Settlements with dyes before the war sent trained men to the Orient to study the market and familiarise themselves with the local requirements. These representatives not only placed their products on the market but did much to educate the native consumer in the use of modern dyes. For example, they showed a local dyer how to obtain a certain black effect with one dipping which had previously been obtained by fifteen dippings in a cold indigo vat.

Venezuela.—Venezuelan import statistics do not show dyes separately. Germany was the sole source before the war, but her place has now been taken by the United States. The value of dyes exported to Puerto Cabello from the United States, from Jan. to June, 1917, was $3600.—(*U.S. Com. Rep., Sept.* 5, 1918.)

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal* for November 7, 14, and 21.)

OPENINGS FOR BRITISH TRADE.

A firm at Bombay wishes to get into touch with U.K. manufacturers of chemicals, drugs, oils, lubricants, etc. [Ref. No. 341.]

An agent at Owen Sound, Ontario, wishes to represent U.K. manufacturers of soap, druggists' sundries, etc. [Ref. No. 350.]

Firms at Barcelona desire agencies for U.K. manufacturers of chemicals, drugs, etc. [Ref. Nos. 346, 360.]

A merchant at Rabat, Morocco, wishes to get into touch with U.K. firms desiring supplies of pyrethrum root. [Ref. No. 342.]

An agent at Santiago, Chile, desires to represent U.K. manufacturers of steel bars and sheets, tinplate, paraffin wax, soda ash, etc. [Ref. No. 359.]

Firms at Toronto desire agencies for glassware, earthenware, soaps, druggists' sundries, etc. Inquiries should be addressed to The High Commissioner for Canada, 19, Victoria Street, S.W. 1.

Inquiries respecting the following notices should be addressed to The Secretary, British Chamber of Commerce for Italy, 7, Via Carlo Felice, Genoa :—

Firms at Turin desire agencies for U.K. manufacturers of chemicals, pharmaceutical products, tallow, fats and cocoa. [1550.]

A firm at Genoa wishes to buy, on commission, from manufacturers and exporters of soap, oils, oil-seeds, etc. [1558.]

An agent at Genoa desires to represent exporters of oils, greases, and chemicals. [1551.]

An agent at Romagnano Sesia (Novara) desires to buy from or to represent U.K. manufacturers of chemicals and pharmaceutical products. [1589.]

An agent at Florence wishes to represent U.K. manufacturers of chemicals and dyes. [1559.]

A firm at Bari desires agencies for U.K. manufacturers of scientific instruments, chemical and pharmaceutical products. [1555.]

TARIFF. CUSTOMS. EXCISE.

Argentina.—The export of charcoal, mineral oil, kerosene, naphtha, etc., is temporarily prohibited as from August 22. Certain modifications in the customs tariff are proposed for the coming year.

Australia.—The import of caustic soda, soda ash, sodium sulphide, white lead and red lead is prohibited, except under licence, as from August 14.

Recent decisions as to the classification of articles under the customs tariff affect scientific instruments, medicines, paper, petroleum products used in toilet preparations, pyroligneous acid, etc.

Canada.—Amyl alcohol or fusel oil, ale and other beverages, lime and fruit juices, liquors, malt or other, and wines may be imported on a customs licence without a permit from the Canada Food Board when containing more than 2½ per cent. of proof spirit.

All goods imported from Finland must be accompanied by a certificate of origin and interest issued by H.M. Consul at Helsingfors.

Columbia.—The new Coinage Law (No. 15 of 1918) gives the Government special authority to tax, regulate and restrict the exportation of gold and other metals produced in the country as from September 10.

Denmark.—The export of horn, seaweed, glassware, felt, etc., has been prohibited.

France.—The general derogations which permitted certain articles to be exported without special authorisation have been withdrawn in certain cases, *e.g.*, manufactures of rubber (with some exceptions), gums, paraffin wax, resins (other than of pine or fir).

France (New Caledonia).—Molasses and crude ammonium sulphate are among the articles which have been temporarily exempted from import duty, as from October 12.

The French Government has denounced, as from September 10, Article 5 of the Treaty of Commerce and Navigation between France and Japan and also the Treaty of Commerce between France and Nicaragua of January 27, 1902.

Japan.—The export of tin alloys is prohibited as from October 1. The export from Corea of manufactures of which the principal material is gold or silver is prohibited, except under special permit, as from September 4.

Morocco (French Zone).—The export of vegetable fibre is prohibited, except from the port of Saffi, as from October 3. The export of coriander seed will be prohibited as from May 1, 1919.

Portugal.—The export of soap to foreign countries is prohibited, as from October 23.

South Africa.—The import of sugar is prohibited, except under licence, as from September 12. This order does not apply to sugar from Mozambique.

Customs and Excise Tariffs now in operation in the Union of South Africa apply also to the Protectorate of South West Africa.

A copy of the *Government Gazette* of August 30, containing the regulations respecting the sale of fertilisers and farm foods in the Union, may be seen at the Department of Overseas Trade. The regulations come into force on November 30.

Spain.—The export of linseed oil and linseed cake is prohibited, as from September 13.

Switzerland.—Certain kinds of printed matter and samples of all kinds of paper, cardboard, and articles manufactured thereof up to a maximum weight of 350 grams may now be exported.

United States.—Recent rulings of the War Trade Board respecting the restriction of imports affect dyewoods and vegetable dye extracts, rubber, copper ore, etc. Among the articles added to the Export Conservation List are animal fats and oils, bleaching powder, wood pulp, etc.

A copy of the new rules of procedure for the export of steel may be seen at the Department of Overseas Trade.

REVIEW.

Methods of Measuring Temperature. *By* Ezer Griffiths. *Pp.* xi + 176. *(London: C. Griffin and Co., Ltd.* 1918.) *Price* 8s. 6d. *net.*

The scientific control of industries, and especially of the chemical and the closely-allied metallurgical industries, is largely bound up with the measurement of temperature. A new book dealing with the whole subject in a really fundamental manner is therefore to be cordially welcomed at the present time when, it may be hoped, there is not only a greatly increased incentive to the application of scientific control to industries, but also a demand for an improvement in the methods of measurement and a clearer understanding of the physical principles upon which those methods are based. It must be admitted that many workers, even those claiming to be thoroughly scientific, have made use of temperature measurements without realising at all clearly what the measurements they were making really indicated. It is comparatively easy to take a reading with a thermo-electric pyrometer, or with one of the fine modern optical pyrometers, but how many of those using such instruments and speaking glibly of, say, "1700° C.," really know how far a sound temperature-scale has been established in such ranges, and how far the indications of their instruments have any real physical or only an arbitrary meaning?

It is, perhaps, for such persons that Dr. Griffiths' very concise book is intended, and provided that they have a sound training in physics and are also acquainted with the details of apparatus employed in practice, the book will answer its purpose admirably. It is obviously written by one who is himself familiar with the whole subject and an active worker in its advancement, and such books always bear a very different stamp from the compilations of less competent men. The book, however, has the defects of its qualities in that it deals with many of the difficult physical questions in too concise and advanced a manner, space being given to a discussion of outstanding difficulties and problems rather than to the elucidation of the comparatively elementary details of either theory or experimental appliances. The book cannot, therefore, be regarded as in any sense a handbook for the use of the practical man wishing to know something of the principles and theory of temperature measurement. Such a reader would find it difficult to connect what is dealt with in the book with his practical apparatus and problems. It is to be hoped, therefore, that Dr. Griffiths will at some future time expand his book in both the directions indicated—by making the theoretical portions more self-contained and readily grasped by others than expert physicists, and by including more detailed descriptions of practical pyrometric apparatus so as to link up the theoretical considerations with the practical problems.

To the expert physicist in search of a statement of the existing position in regard to temperature measurement, Dr. Griffiths' book may be warmly recommended; the treatment of the radiation and optical pyrometer and its theoretical basis in the laws of Stefan-Boltzmann and of Wien-Planck is particularly full, while such subjects as the emissivity of heated metals and the distribution of energy in the spectrum are specially well treated. A valuable feature of the book is provided in a series of carefully drawn-up bibliographies at the end of each chapter—a method of giving references much to be preferred to the use of endless foot-notes.

Since high-temperature measurements largely relate to metals and their melting-points, a reference to a purely metallurgical point which occurs in the book may perhaps be admissible. In describing experiments on the emissivity of copper when heated in an atmosphere of hydrogen, Dr. Griffiths quotes Stubbs as saying that no deterioration of the surface set in until 10° C. below the melting-point, "when recrystallisation rapidly set in." Since wrought copper is known to undergo recrystallisation at temperatures well below 500° C., this statement appears remarkable. Apparently, however, what is meant is that the surface became roughened by the appearance of relatively coarse crystal outlines. This, of course, is a familiar phenomenon known to metallurgists as the formation of "heat reliefs," and does not necessarily accompany re-crystallisation. The cause of the phenomenon is still obscure, but its effect on emissivity is interesting. W. Rosenhain.

Special Reports on the Mineral Resources of Great Britain.—*Lignites, Jets, Kimmeridge Oil-Shale, Mineral Oil, Cannel Coals, Natural Gas. Part I.—England and Wales.*

The Board of Agriculture and Fisheries gives notice of the publication of the Seventh Volume (price 2s. 6*d.*) of the Special Reports on the Mineral Resources of Great Britain which have been prepared by the Director of the Geological Survey in response to numerous inquiries that have arisen through the conditions brought about by the war.

This volume deals with the lignites of Bovey Tracey, the explorations which have been made in them by Germans and others, and the uses to which they have been put. Other less important examples of lignite are enumerated, and an account is given of the uses and working of jet. The distribution and qualities of Kimmeridge oil-shale throughout the country are described in detail. The principal known occurrences of mineral oil are also dealt with. The existence of cannel coal, under its various names, is recorded for many coalfields, and an account is given of the presence of natural gas in various formations, apart from coal measures.

PUBLICATIONS RECEIVED.

Bulletin of the Imperial Institute. Vol. XVI. No. 2. April-June, 1918. *Pp.* 270. *Price* 2s. 6d. *(London: John Murray.)*

The Recovery of Vapours from Gases. (Particularly of Benzene and Toluene from Coal Gas.) *By* H. S. Davis *and* M. D. Davis. *Report No. 2 of the Dominion of Canada Honorary Advisory Council for Scientific and Industrial Research. (Ottawa,* 1918.)

Platinum for the Year 1916. *By* G. F. Kunz. *Reprinted from Mineral Industry, Vol.* XXV. *(London: Hill Publishing Co. New York: McGraw-Hill Book Co.)*

New Zealand Brown Coals, with Special Reference to their Use in Gas-Producers and for Low-Temperature Distillation. *By* H. Rands *and* W. O. R. Gilling. *Bulletin No.* 1. *New Zealand Board of Science and Art. (Wellington: M. F. Marks, Government Printer.* 1918.)

The Iron and Steel Institute. Carnegie Scholarship Memoirs. *Edited by* G. C. Lloyd. *Vol. IX.*, containing: The Chemical Detection of Strain in Iron and Steel by their Reaction with Nitric Acid, by J. H. Whiteley and A. F. Hallimond; An Investigation of the Wearing and Anti-frictional Qualities of Cast Iron, by J. E. Hurst; Protection of Iron with Paint against Atmospheric Corrosion, by J. Newton Friend; Effects of Cold-Working on the Elastic Properties of Steel, by J. A. Van Den Broek. *Pp.* 169 *and* 9 *plates. (London: E. and F. N. Spon, Ltd. New York: Spon and Chamberlain. Sold also at the Offices of the Institute,* 28 *Victoria Street, S.W.)*

PERSONALIA.

At a Degree Day of the University of Birmingham on November 12, the degree of Doctor of Laws was conferred upon the Rt. Hon. Lord Moulton.

Sir Herbert Jackson is now Director of Research to the British Scientific Instrument Research Association, and Lieut.-Col. A. W. Crossley has succeeded him as Daniell professor of chemistry at King's College, London.

Dr. R. M. Caven, lecturer in chemistry at the University College, Nottingham, and immediate past-chairman of the Nottingham Section of this Society, has been appointed principal of the Technical College, Darlington.

The death is announced of Mr. E. C. Durden, A.R.S.M., at Ottawa, on October 11. The deceased, who went to Canada five years ago, was a prominent member of the staff of the Royal Mint at Ottawa.

Mr. J. Glass, of Edinburgh, has offered securities of the value of £20,000 to the Edinburgh Merchant Company for the purpose of establishing a school of chemistry at the George Watson College, Edinburgh, and has also expressed his willingness to endow a scholarship in science of the value of £50 per annum.

The Davy medal of the Royal Society has been awarded to Prof. F. S. Kipping, for his studies in the camphor group and among the organic derivatives of nitrogen and silicon; a Royal medal has been awarded to Prof. F. Gowland Hopkins for research in chemical physiology, and the Hughes medal to Mr. I. Langmuir for his researches in molecular physics.

A Reuter message announces that the Swedish Academy of Sciences has awarded the 1917 Nobel prize for physics to Prof. C. G. Barkla, professor of natural philosophy at Edinburgh University, on account of his discoveries of the characteristics of the Röntgen radiation of the elements. The value of the prize is said to be about £8050. The prize for physics and the prizes for chemistry for 1917 and 1918 are reserved until next year.

OBITUARY.

E. F. HARRISON.

The death of Edward Frank Harrison at the early age of 49 leaves us to regret the loss of a colleague, who was a good friend, an expert pharmacist, a clever chemist, and a genius for organisation. As a student he held one of the Jacob Bell Scholarships at the School of the Pharmaceutical Society, in 1890—1891, and there attracted from his fellow students a number of men who were associated with him for the rest of his life. Later on he was demonstrator of chemistry under Prof. Wyndham Dunstan, and took part in the research on the alkaloids of aconite then in progress.

Five years' work at Newcastle, and subsequently six years as chief analytical chemist to Messrs. Burroughs Wellcome and Co., at Dartford, furnished him with an experience which justly warranted his establishment, as an expert analyst, of a laboratory of his own in London. Here, his special knowledge was given in part to work for the British Medical Association, which resulted in the publication of "Secret Remedies," but a great portion of his time was given to honorary work for the publication of the British Pharmaceutical Codex. In this he was assisted by his partner, P. A. W. Self, and their joint work on commercial drugs gave them a unique position as drug analysts in London.

Shortly after the outbreak of war, he joined the Sportsman's Battalion of the Royal Fusiliers as a private, as the quickest way into the army, but subsequently transferred into the Royal Engineers, where his promotion was very rapid. As an officer in the Royal Engineers, and one of the chiefs in the Chemical Warfare Department of the Ministry of Munitions, he helped to organise the anti-gas campaign, and produced the box respirator which saved thousands of lives in the English, French, Italian and American armies. The respirators were turned out in millions for the protection of the troops, and every conceivable contingency had to be provided for. With what thoroughness and ability he carried out his task is known only to his immediate associates, but he was promoted to the rank of Lieut.-Colonel, awarded the C.M.G. and made *officier* of the Legion of Honour. Shortly before his death he was made Controller of the Chemical Warfare Department.

The success which he attained was largely due to his personality and ability to make the best use of the men who worked with and for him. His untiring energy was an effectual example, his wonderful perspicacity and his capacity for detail, gave him the power to lead, where few men could have gained a following. He was proud of his pharmaceutical training, and his Ph.C. ranked first in his own estimation, but he was also a Bachelor of Science of London University, and a Fellow of the Institute of Chemistry. In pharmaceutical, chemical and social spheres, Harrison's motto was assuredly, "Give! give self! give service!" and he gave freely and of his best, until he gave his life at a time when his work with the army was completed, a few days before the armistice was signed.

A memorial service was held at the Memorial Chapel, Queen Alexandra's Auxiliary Hospital, Millbank, on November 8, and the interment at Brompton Cemetery was accorded full military honours.

C. E. SAGE.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor*.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably typewritten) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.* [*Telephone: London Wall, No. 2429. Telegraphic Address: Induchem, Finsquare, London.*]

CHLORAMINE REACTIONS OF PROTEINS.

J. F. BRIGGS.

The attention which has been paid to the use of hypochlorous acid in antiseptic surgery in recent times has indicated the necessity for a clear exposition of the chemical functions of the chloramines generally and of the chloramine derivatives of the proteins in particular. A complete discussion of the clinical aspect of the subject recently appeared in a paper read before this Society by Dr. T. Rettie (this J., 1918, 23 T), and reference may also be made to publications by Dakin and others (this J., 1915, 919, 977; 1916, 651). The object of the present note is to recall attention to the important researches of Raschig (Ber., 1907, **40**, 4586; Chem.-Zeit., 1907, 31, 926), in which the reactions of the chloramine group were outlined, and a process for the preparation of hydrazine by means of these reactions was established. About the same time, Cross, Bevan, and Briggs (this J., 1908, 261) found in Raschig's results the explanation of certain hitherto obscure facts in connexion with flax bleaching, and indicated the future importance of this general reactivity of the amino group. As an industrial operation the chlorination of wool had long been known, and the physical modification produced by the treatment utilised, but the persistence of the active chlorine in the treated protein was considered more or less as a technical perversity rather than a fundamental consequence of the reaction.

Our investigation of this wide subject did not pretend to be exhaustive, and many "loose ends" were left both in the qualitative and quantitative aspects of the subject. Raschig's original work related only to the monochloramine group, NH_2Cl, or in the case of organic amino compounds RNHCl, and the circumstances under which the second hydrogen atom is replaceable by halogen were left undecided. This uncertainty, coupled with the susceptibility of the products to progressive decomposition, led to the failure which we subsequently encountered in our attempts to establish an easy iodometric method for the estimation of amino nitrogen in solution, after removing the excess of hypochlorite by hydrogen peroxide and the excess of the latter by shaking with black manganese dioxide. Positive results were obtained for a large variety of compounds, but their variation with the time and temperature factors caused us to abandon hope of producing a workable analytical process

All kinds of protein derivatives give the chloramine reaction regardless of their state of complexity and solubility. Thus, complex protein colloids like silk and wool combine with the halogen without entering into solution, gelatin in aqueous solution is precipitated in the form of an insoluble chloramine, peptones, albumoses and simple amino derivatives give chloramine compounds which are soluble in their respective degrees. This wide range through all grades of colloids and colloidal solutions to crystalloids explains the observation that at certain stages colloidal chloramines may be absorbed from old bleaching liquors by vegetable fibres. Certain observations made in those early days are worth recalling in view of the physiological interest which this group of compounds has attained. It was suggested at that time that the persistent odour which clings to the hands after immersion in hypochlorite solutions was due to protein chloramine, and this suggestion appears to have been fully corroborated. Other cases of "chemical" odours developed in bleached fabrics have been traced to a similar cause.

In the recent clinical publications great stress has been laid on the alkalinity of hypochlorite solutions and on the necessity of counteracting this alkalinity by the addition of a weak acid. It must, however, be pointed out that part of this reputed alkalinity of the hypochlorite solution may really be the result of the chloramine reaction. It is certainly the case that a solution of sodium hypochlorite adjusted to complete neutrality by titration still feels strongly "caustic" to the hands. This is explained by reference to the original reaction $RNH_2 + NaOCl = RNHCl + NaOH$. Whenever a chloramine is formed from a neutral hypochlorite, caustic alkali is liberated, and it would be interesting to ascertain whether this equation is capable of affording a volumetric analytical method. Alkali acts to a certain extent as a stabilising agent on the chloramines, and, on the other hand, when a neutral chloramine decomposes, hydrochloric acid is liberated according to the reaction $3RNHCl = N_2 + RNH_2 + 3HCl$. From these two equations the advantage in surgical work of the addition of a polybasic acid, such as boric acid, capable of giving amphoteric salts, becomes very obvious.

In our technical investigations we paid special attention to the chloramine reactions of gelatin as typical of the group, depositing it on cotton yarn as an aqueous solution, and fixing it in the form of insoluble chloramine. This treated yarn, after thorough washing, still retained the active chlorine reaction. Previous combination with formaldehyde did not affect the normal course of the reaction. If a cake of dry gelatin is steeped in a hypochlorite solution for several hours the outside is converted into a hard layer of insoluble chloramine, but the gelatin swells in the ordinary manner. If it be then washed and transferred to hot water, the gelatin of the interior dissolves and is liberated by puncturing the outer skin, leaving an empty bag of gelatin chloramine. It is possible that this phenomenon might be utilised in diffusion experiments, and the chloramine membrane might exhibit special semipermeable effects. When the gelatin chloramine is dried in the oven it is decomposed with the evolution of gas and development of free hydrochloric acid.

As a qualitative test for localised deposits of proteins the chloramine reaction is unexcelled. Stains of protein fluids on fabrics, the presence of wool fibres in cotton, the presence of glue or casein in adhesives and coatings, are easily demonstrated by chlorinating, washing, and developing the colour reaction with potassium iodide and starch. The most minute fragment of the sample will suffice for the test, and in special cases the original sample of fabric may be restored uninjured by treating with an "antichlor" after performing the test. The localisation of protein in plant tissues can be demonstrated in the same way by the treatment of their sections: for instance, a thin slice of potato shows a very beautiful network.

Enough has been said to indicate the wide field of research which is open for the development of the quantitative relations of this interesting reaction in the light of recent discoveries, and particularly for the study of the functions of the peculiar form of "active chlorine" which characterises the group, and which reacts with iodides in the proportional equivalent of $Cl = I_2$. What are the limits of its oxidising activity? For example, it readily oxidises iodides, arsenites and sulphites, but apparently will not bleach colouring matters. If it is conceded that the antiseptic value of hypochlorites is due to the formation of protein chloramines, what is the chemical explanation of the antiseptic action of the chloramines themselves either as formed in the tissues or as applied in the

form of pharmaceutical preparations? The essential characteristic of the group is instability, and its relationship to the highly explosive nitrogen chloride would account for this. C. F. Cross patented the preparation of methylene chloramine from formaldehyde-ammonia (Eng. Pat. 15,303 of 1909; this J., 1910, 976), which is also somewhat explosive, but it is recognised that certain classes of chloramines, including those of the nitrogenous colloids, are, comparatively speaking, stable compounds.

MOLYBDENUM WITHIN THE EMPIRE.

SYDNEY J. JOHNSTONE,

Scientific and Technical Department, Imperial Institute.

Although molybdenum has been known to chemists for more than a century, it has only quite recently come into prominence on account of its use as a steel hardener, in which respect it resembles tungsten. The metal is not found free in nature, but occurs usually in combination with sulphur, oxygen or lead. The only ores of commercial importance are *molybdenite* (MoS_2), a soft lead-gray mineral with a metallic lustre, resembling graphite but much heavier, and *wulfenite*, a lead molybdate, which has a yellow colour, an adamantine lustre, and usually contains small quantities of copper, calcium, vanadium and iron. The world's production of molybdenum ore concentrates during recent years has been as follows:—

	1913 Tons	1914 Tons	1915 Tons	1916 Tons	1917 Tons
Queensland	66	78	97	81	111
New South Wales...	78·8	61	31·7	54	70
Canada	—	2	12	74[1]	121[1]
India...	—	—	—	0·4	1·7
Norway	3·5	53·1	80[1]	100[1]	—
Germany	—	—	—	[4]	[4]
Spain...	—	—	5[1]	145[2]	—
Sweden	—	7	37	3	—
Bolivia	—	—	5	—	—
Peru	—	—	4	4·5	—
Japan	—	—	11[1]	33[1]	—
United States	—	—	90[3]	—	—
Total	148·3	201·1	372·7	494·9	

[1] Estimated quantity of MoS_2 in ore produced.
[2] Includes wulfenite and low grade ores.
[3] Estimated quantity of Mo in ore raised.
[4] Molybdenite produced, but no record of output.

Although molybdenum minerals are fairly widely distributed, deposits of proved commercial importance are few. The largest producers in the past have been the Australian States of Queensland and New South Wales, but the United States, Canada and Norway are now rapidly becoming very important contributors to the world's supply. Low grade ore bodies carrying molybdenite are of fairly common occurrence but high grade deposits such as were almost exclusively worked before the war, are somewhat rare. About three-quarters of the world's output of molybdenum ore has been won from tungsten and bismuth deposits, and a smaller quantity has been obtained as a by-product in the mining of tin.

Australia.—For many years prior to the war, Queensland was the most important molybdenite producer in the world, most of the ore being raised at Wolfram in the Chillagoe mineral field and smaller quantities at Bamford. The first production recorded was made in 1900 when 11 tons of high grade concentrates were produced. The total output of concentrates since that date has amounted to 1266 tons, valued at £290,094. The deposits are often in the form of contorted pipes very similar to those occurring in New South Wales. A very promising occurrence has recently been opened up on the Stanthorpe mineral field. The deposit is yielding molybdenite and bismuth ore, the latter being obtained from the "fines" remaining after the separation of the molybdenite. Molybdenum ore has also been mined at Sandy Tate river, Chillagoe Field; Kidston, Etheridge Goldfield; Ollera Creek, Star Mineral Field. The Chillagoe field has produced at least 95 per cent. of the output during the years 1912 to 1917.

New South Wales has been a producer of molybdenite since 1902, and is stated to have yielded about 25 per cent. of the world's supply from that date up to 1915. The total quantity of ore exported to the end of 1917 amounted to 600 tons, valued at £124,900. The principal mines are situated at Whipstick in the Pambula division, where there is a concentrating plant capable of treating 25 tons of ore per day; at Kingsgate, in the Glen Innes division; and near Deepwater. The mineral has also been found in a number of other localities, descriptions of which are given by E. C. Andrews in "The Molybdenum Industry of New South Wales" (Bull. 24, N.S.W. Dept. Mines). The production of ore in New South Wales has not responded to the impetus of war prices to the same extent as have those of certain other countries, notably Canada. This is, in some measure, due to its occurrence as irregular "pipes," in which there is little ore in sight, and the owners are therefore usually unwilling to invest in expensive concentrating plant for separating the molybdenite from the associated bismuth, wolfram and gangue minerals. There is also a heavy freight from most of the mines to a port of shipment.

In Victoria molybdenite occurs in a lode traversing granite at Wangrabell in East Gippsland and an occurrence at Dunneworthy near Ararat is being prospected; the mineral having been found in ten paralleled quartz reefs covering an area of 4·5 acres. In the Beechworth district large molybdenite deposits have been located in a granite hill at Everton and a treatment plant is under consideration. A syndicate has recently been formed to work the deposits occurring at Mt. Mollagul, a few miles from Tarnagulla.

In South Australia small quantities of molybdenite have been obtained as a by-product in copper mining from the North Yelta mine at Moonta, about 125 miles northerly from Adelaide. The molybdenite occurs in scattered bunches in the copper ore and is picked out during the dressing of the latter.

The destination of molybdenite raised in and exported from Australia during recent years is shown in the following table:—

*Export of Australian Molybdenite.**

Destination	1911 cwt.	1912 cwt.	1913 cwt.	1914 to June, 1915 cwt.	1916† cwt.
United Kingdom...	301	573	1,724	1,972	1,861
France	930	1,271	213	48	708
Germany	606	1,026	747	49	—
Belgium...	39	3	—	—	—
United States ...	—	—	—	11	—
	1,876	2.873	2,684	2,080	2,569

* From "Trade Customs and Excise Revenue of the Australian Commonwealth."
† Year ending June 30.

Tasmania.—A number of deposits containing molybdenum ore have been reported, and several of these are stated to be worthy of further prospecting, particularly those near Mt. Stronach. So far no output has been recorded. A full account of the occurrence of molybdenite in Tasmania is given in Mineral Resources Bull. 1, Tasmanian Geol. Survey.

New Zealand.—Molybdenite occurs in pockets and small stringers at the Iron Cap Mines of Tararu, Thames; in a copper deposit at Mt. Radiant; at Dusky Sound on the West Coast of Otago; and in the Paparoa Range. Wulfenite occurs in the Dun Mountains of Nelson. So far as can be ascertained, no molybdenum ore has been exported from New Zealand, but several of the occurrences are worthy of attention.

One of the most promising deposits is that at Mt. Radiant in the Westport division, where molybdenite is found in a low grade copper deposit which is being prospected. The reef has been traced for a considerable distance and is stated to carry from 0·3 to 1·7 per cent. of molybdenum.

During 1916-17 molybdenite was found in quartz at the Waihi Extended mine in thin irregular veins intersecting a shaft at 1318 ft. Selected samples of the ore were found to contain about 8 per cent. of molybdenite, but bulk samples contained under 1 per cent. of the mineral.

Canada.—Although molybdenite deposits have been known to occur in numerous localities for many years past, it was not until the year 1915 that any appreciable production of ore was recorded. Molybdenite is the chief molybdenum ore found in Canada, and it usually occurs associated with pyrite, pyrrhotite and mica, but, unlike the Australian ore, does not usually carry an appreciable quantity of bismuth or wolfram ore. The present development of the molybdenite deposits in Canada will probably be considerably assisted by the concession made in January, 1918, by the Dominion Government, to permit the full export of molybdenum and tungsten ores, concentrates and products to approved consignees in the United States and France.

During 1916 and 1917 considerable progress was made not only in the development of Canadian molybdenite mines, but also in the concentration of low grade ore and its conversion into ferro-molybdenum in Canada. It was stated that almost the whole of the molybdenite raised in Canada in 1917 was converted into ferro-molybdenum either at Orillia or Belleville.

By far the greater proportion of the molybdenite ore so far raised in Canada has been produced in Quebec, where during 1917 the output of molybdenite concentrates amounted to over 101 tons, valued at about £49,603. The content of MoS_2 in the concentrates was usually about 75 per cent. or over. In 1916, the Canadian Wood Molybdenite Company's Moss mine at Quyon had the largest output in Canada, having a production of 5000 short tons of ore carrying about 1·74 per cent. of MoS_2. This yielded 81 per cent. of the total quantity of concentrates produced in Canada in that year. The mine is now equipped with a plant capable of treating 200 tons of ore per day. In April, 1917, the Moss mine was purchased by an American syndicate, and the Dominion Molybdenite Co. formed with a capital of $5,000,000. Considerable development work was done in 1917 at the mine, including 12,000 ft. of diamond drilling and large reserves of ore were blocked out.

Considerable work has also been carried out on deposits situated near Aldfield township, and molybdenite has been obtained from deposits in the townships of Eardley, Clarendon, Onslow, Masham, Egan and Huddersfield.

In 1915, 192 tons of molybdenum ore and about half a ton of concentrates were produced in Ontario, the whole being valued at $14,099. In 1916, the output rose to 11·8 tons of concentrates, valued at $26,393, these concentrates being obtained from the treatment of about 893 tons of ore. In 1916, nearly 50 per cent. of the concentrates resulted from the treatment of ore at the plant of the Mines Department, Ottawa, whilst the remainder was produced by plants at Renfrew, Dacre and Mt. St. Patrick.

Ferro-molybdenum was made in 1916 by the International Molybdenum Company at Orillia and the Tivani Electric Steel Company at Belleville, by electric furnace processes. Over 100,000 lb. of 70 per cent. ferro-molybdenum has been produced, so far, from the last named works.

During 1916, ore was raised from deposits in Brougham township, Mt. St. Patrick, Sommerville township, Dacre, South Porcupine and Monmouth township, whilst development and prospecting work were in progress in many other occurrences.

During the summer of 1917 considerable development was done at the Taylor Molybdenite mine near Renfrew. About 19 tons of ore carrying 3·4 per cent. of pure molybdenite was sent to Ottawa, besides a quantity of high grade ore carrying 65 per cent. of the mineral.

Molybdenite deposits occur in many localities in Ontario, and the result of a recent investigation of the more important is given in Ann. Rep. No. 26, Ontario Bur. Mines, 1917.

Considerable activity has been shown recently in British Columbia. The stati tics of production for 1916 are as follows:—

Mine or district	Output Short tons	Content of MoS_2 in ore per cent.
Alice Arm...	383	2
Molly Mine, Lost Creek	15 to 20	12
Index Mine, Texas Creek	9	16
Keremos Mine...	2	30

It is understood that a considerable tonnage of low grade ore was awaiting treatment at the first three deposits. The largest output was obtained from the Ross Group about 5 miles from the head of Alice Arm in the Skeena Mining district, where a plant for concentrating 200 tons of crude ore per day was in course of erection in 1916.

The Index mine on Texas Creek in the Lillooet district contains a considerable tonnage of low grade ore besides a smaller quantity of material carrying 7 to 12 per cent. of MoS_2. Although much prospecting for molybdenite was done during 1917, the output amounted to only 152 tons of ore, equivalent to 5·3 tons of molybdenite, the whole amount being obtained from the Molly mine.

Newfoundland.—In Newfoundland at various times the occurrence of deposits of molybdenite has been reported, but there seems to be no record of their exploitation.

West Indies.—A sample from the Virgin Islands, stated to be from an old tailings heap, was examined in the Scientific and Technical Department of the Imperial Institute and found to contain 81·5 per cent. of molybdenite.

Union of South Africa.—Molybdenite has been recorded to occur in a number of localities, but so far only three appear to be worthy of mention as possible producers. A small quantity of ore containing 15 per cent. of molybdenite was shipped to Europe in 1915 from the deposits at Stavoren in the Waterberg district of the Transvaal. The ore, which occurs and is worked with tinstone, is stated to be present in too small quantity to repay working alone. Promising deposits worthy of attention are reported to occur at Houtenbeek in the Pretoria district.

In Natal, molybdenum ore occurs at Impendhle, partly as an alteration product in a bed of pyritic sandstone. Little work has been done on the deposit, which is reported to carry about 8 per cent. of molybdenum in a form soluble in water, and to have been traced by its outcrop for several miles. About 64 tons of the ore was exported in 1905.

South West Africa.—Molybdenite has been found in small quantities in numerous localities. At

Tsumeb in the Otavi district, wulfenite is found with oxidised copper ores.

Rhodesia.—Molybdenite, usually associated with bismuth ore, has been found in the Hartley, Insiza, Bulawayo and Umtali districts. In the Insiza district a number of reefs carrying the ore occur west and north of the Filabusi group of gold mines.

India.—Molybdenum ores do not appear to have been produced in India until 1916, when there was an output of 8 cwt. of concentrates from the Tavoy district of Burma. Molybdenite has been recorded to occur in Bengal, Chota Nagpur, Rajputana and Travancore, but no deposits of commercial value have been developed.

Ceylon.—Deposits of molybdenite occur at Hettimulla near Kegalla, and a sample examined at the Imperial Institute contained 51 per cent. of molybdenum. Unfortunately, the deposit does not appear to be extensive.

United Kingdom.—Molybdenite has been recorded to occur in certain Cornish copper and tin mines, and in the West of Ireland, but not in payable quantities. Small amounts have been produced in Inverness-shire.

The above *résumé* shows the British Empire to be well supplied with deposits of molybdenum ore, about 70 per cent. of the world's pre-war output having been obtained from Australia. The demand for molybdenum for war purposes and consequent high prices have led to the working of low grade deposits previously considered unremunerative, a notable example being those of Quebec, which now contribute a large proportion of the world's output of molybdenum ore.

THE BRITISH SCIENTIFIC GLASS INDUSTRY.

A very strong plea for the establishment on a secure basis of the scientific, heat resisting and chemical glassware industry, has been addressed to the Inter-Departmental Glass Trades Committee by a Joint Committee of the British Chemical Ware Manufacturers' Association, the British Flint Glass Manufacturers' Asociation, the British Lampblown Scientific Glassware Manufacturers' Association, and the British Laboratory Ware Association.

After referring to the extreme seriousness of the shortage of glassware for scientific purposes at the outbreak of war, the petitioners emphasise the "key," or rather "master key," nature of this industry, pointing out that all industrial development depends primarily on progress made in the laboratory. A long list of industries is enumerated which use special glass apparatus as well as the ordinary kinds, and this list must be lengthened by the inclusion of County, Municipal, School, College, Medical and Private Laboratories: "in fact there is no branch of our national life, economic or social, which is independent of scientific and chemical glassware."

A start has been made towards establishing an industry during the war, but, for various reasons, it has not been possible to obtain an adequate supply of the essential skilled labour. The conditions in which scientific glassware was manufactured abroad would never be allowed to obtain here, and therefore our costs of production must needs be much higher. The present wholesale prices of British scientific glassware are about 2—4 times the pre-war prices of the foreign articles. Comparative figures of costs for 1914 and 1918 show that both wages and materials have risen in this country by more than 100 per cent. The Industry has not been in a position to prepare for post-war trade, as the cost of initiating it (in some cases, the excess profits duty) has prevented the accumulation of funds, and it has been impossible to train labour for peace time work as it has been concentrated on essential war orders.

In addition to the above considerations, there are further reasons calling for special treatment of this industry. British works erected in war time have cost three or four times as much as German and Austrian works established before the war, and therefore the interest alone on the extra capital will represent a good profit to these competitors before we can begin to make any profit at all. As, in general, labour costs represent about 45 per cent. of the total cost of chemical glass articles, and fuel more than a further 15 per cent., the maintenance of the industry will necessitate measures being taken to equalise the selling prices of British-made and foreign-made goods in home markets. Time must be granted for the adequate training of workmen to replace the Belgian labour which has been employed in some of our factories. Owing to the diversity of the demands for chemical, scientific and medical glassware, labour has been continually shifted from one kind of work to another, thus preventing the specialisation necessary for the attainment of high skill. Many of the more difficult articles have not been attempted owing to lack of furnaces or labour.

In order to satisfy the demands of the home market, large extensions of plant must be undertaken, and this the manufacturers are extremely anxious to do, having been prevented hitherto by scarcity of building materials, lack of skilled labour and the uncertain outlook for the industry.

For the above reasons, the Associations concerned petition the Government to consider and grant the following:—

(1) That the importation of all chemical, scientific and medical glassware, glass tubing and rod, be prohibited for a period of ten years after the termination of the war, subject to licences being granted for the importation of such articles as are not manufactured in sufficient quantities or of satisfactory quality in this country. Such licences only to be issued on the recommendation of the appropriate Government department after consultation with and the acquiescence of the signatory Associations.

(2) That during the period of prohibition the prices that may be charged in this country be subject to general approval between the Government and the Associations concerned.

(3) That after the expiration of the prohibition period, and in the case of any articles that may be imported forthwith under licence as above, such a duty be imposed on importation as shall insure that the makers of the foreign article, produced under conditions of cheap labour, preferential freight charges, or Government aid of any sort, shall not be in a better position than British manufacturers to compete in our home markets; and that the "anti-dumping" laws at present in force in America be put into operation in this country.

(4) That prompt and generous Government assistance be granted towards the cost of providing forthwith new buildings and plant in any approved case.

(5) That the Government take steps to safeguard the supply of raw materials required for the manufacture of chemical, medical and scientific glassware.

(6) That all Government departments, local authorities, State-aided institutions, schools and colleges in receipt of Government or local grants when purchasing supplies of chemical, medical and scientific glassware be compelled to indent exclusively for goods of British manufacture.

Corrigendum.—Alkaloids of Opium, p. 430 R, line 39 from bottom: for "incineration" read "decolorising with charcoal."

NEWS FROM THE SECTIONS.

NEWCASTLE.

This Section held its second meeting in the Bolbec Hall, Newcastle, on November 20, Prof. Bedson presiding.

Mr. W. Diamond read some "Notes on the Estimation of Sulphur in Spent Oxide." He said that the usual method of estimation by extraction with carbon bisulphide was inaccurate as this solvent also removed tar and other organic matter; hence the sulphuric acid maker was asked to pay for units of sulphur that were not present, and disputes were frequent. After discussing preliminary treatment with sulphuric and sulphurous acids and subsequent extraction with carbon bisulphide, Mr. Diamond described a method whereby the spent oxide was treated with benzene to remove tarry matter. The extract was divided into two equal parts, in one the total extractive matter was estimated, in the other the sulphur was estimated as barium sulphate after oxidation with nitric acid. The difference was taken as tarry matter. The amount of the latter was then subtracted from the residue from the ordinary bisulphide extraction and thus the true sulphur was estimated.

Mr. G. Weyman then contributed a paper on "The Relation between Molecular Structure and the Activity towards Hydrogen Sulphide of Oxide of Iron." The iron sulphides with which gas managers are concerned are the sesqui-, the di-, and the mono-sulphides, and in ordinary practice the first-named is the chief product. The removal of sulphuretted hydrogen from gas by means of iron oxide is more thorough when the iron oxide is in an alkaline condition. The author detailed experiments which showed that when iron oxide was heated to 650° C. it still retained its activity towards hydrogen sulphide, but above that temperature the activity fell off considerably. This applied to oxide which was cooled slowly; if, however, the oxide were cooled suddenly by plunging into water, much of the activity was restored. An experimental study of the behaviour of iron oxide, obtained from different sources, to hydrogen sulphide at different temperatures led to the conclusion that its successful use in gas purification could only be attained if its exact nature, including its degree of polymerisation, were known. The hydrate produced by oxidation of ferric sulphide was not of the same type as the crimson, reddish-brown or dark brown varieties obtained by precipitating ferric salts with alkalis, but was a yellow or light brown substance similar to that formed by atmospheric oxidation of the hydrates precipitated from ferrous salts. The natural ores used in gas purification had probably been formed in a similar manner by precipitation under reducing conditions and subsequent oxidation. Further, the red hydrates, after the first fouling and oxidation, gave similar brownish-yellow hydrates, and it was with these that gas purification was concerned. Further study on these lines would reveal important practical and theoretical results.

NOTTINGHAM.

The third meeting of the session was held on November 27 in the University College. Dr. R. M. Caven was in the chair.

Dr. W. E. S. Turner of the Department of Glass Technology, Sheffield University, gave an address on "British Glassware: Its Characteristics and Future Prospects." Previous to the war British glass manufacture was in a state of decay; and no research bearing directly on the subject was published between the years 1900 and 1914. During this period the British industry was confined to the manufacture of bottles, boiler gauge tubes, and a limited amount of artistic and optical glassware. For scientific and surgical glass, as well as for electric bulbs, lighting glasses, and much optical glass, we were dependent on enemy countries, and British officers consequently went into the war with German field glasses. The steelworks chemists of Sheffield required chemical glassware for war work; hence arose the glass-technology department of Sheffield University. In addition, glass was required for ampoules to hold drugs, for submarine mines, for spectacles and artificial eyes, as well as for general chemical work.

Much attention has been given to the manufacture of glass to resist the action of water, acids and alkalis. Resistant properties depend on three factors: (i) *Temperature of the reagent in contact with glass.* Moderately good glass is scarcely attacked by water below 90° C., but from 90° to 100° C. the solvent action rapidly increases. (ii) *Previous treatment of glass.* If a bottle is to hold conductivity water, such water should stand in it for a previous period and then be rejected. Subsequently the glass will be less attacked. (iii) *Composition of glass.* Glass rich in silica resists the action of water, and boric oxide confers high resistant power. "Pyrex," an American war glass, contains 80 per cent. silica and 12 per cent. boric oxide. Glasses containing much silica, however, are attacked by alkali, but the latter is resisted by lime. Only alumina resists water, acids and alkalis, but no single glass has this power. Thus a compromise has to be made, and several glasses are manufactured each with special resisting power. Other properties to be considered are mechanical strength and power to resist fracture by heat. Proper annealing is very important, and also the making of glass without flaws or strain.

GLASGOW.

On November 26 an informal meeting was held at the North British Hotel, Glasgow, Mr. Quintin Moore being in the chair. Although the attendance was not large, several interesting topics for discussion were introduced, among which were "Rings for Inverted Incandescent Mantles," "Fuel for Internal Combustion Engines," and "The Future of the Sulphuric Acid Industry." A very good discussion ensued in which most of the members present took part.

BIRMINGHAM.

At a meeting of the Birmingham and Midland Section on November 27 at Birmingham, a paper was read on "Notes on Chemical Standards and their bearing on the Unification of Analysis" by Messrs. C. H. and N. D. Ridsdale, of Middlesbrough. Mr. H. Silvester presided.

The authors pointed out that although differences in sampling accounted for many discrepancies in chemical analysis, the limitations of analytical methods were responsible for more. One valuable point about standards was that by demonstrating the differences between analysts, even under exceptional conditions of uniformity of sample, they forced close attention to and searching investigation of methods themselves. It was important to the manufacturer to have a means of gauging the particular reference chemists' testing, on whose results the acceptance or rejection of large batches of material depended. Scientifically, standards would facilitate the checking of analysts' work, would afford comparison of the value of quick or works methods with that of longer methods, and would assist in checking volumetric solutions and

indirectly checking the purity of reagents. Commercially, chemical standards, properly used, served as a gauge to composition. The question affected works managers and specifying engineers or Government departments vitally, facilitating production by minimising delay and rejections owing to the former being enabled to attune their manufacture and testing to that of the referee. Standards must be as physically homogeneous as possible; some segregation is inevitable, but, for metals, drilling, turning, and milling, tended to ensure uniformity. There should be enough of a standard to last everyone using it for a long time, say several years. As to chemical composition it was important to secure standards the composition of which was near to or slightly above the upper limits of impurities allowed by specification and that contained such elements as interfered with determinations. Discussing a co-operative movement organised by the authors for preparing standards on national lines, Mr. C. H. Ridsdale stated that a large number of chemists in different parts of the country were consulted. In the summer of 1916 preliminary standards were issued, tested by five chemists. Late in that year circulars as to "Standard Analysed Samples" were sent to 120 chemists and co-operation invited. The first standard on this extended basis, tested by eight analysts, was issued in March last year. In the system of standardising several elements and issuing a printed certificate showing the results of each chemist, the practice of the U.S. Bureau of Standards was followed; but a new feature was introduced which consisted in carefully selecting the analysts for each standard, so that there should be a fair proportion representing each opposite section of the industry—makers who had to work to specifications, and Government departments, railways or other users who issued specifications; and on the third, independent referee analysts. The question of standards demanded wide support. Technical societies combined could no doubt set up a central bureau on a scale equal to that of the U.S. Bureau which should meet the financial difficulties. If the need of mechanical standards required an engineering standard committee, surely chemical standardisation demanded equal attention.

Mr. G. S. Blake (Ministry of Munitions Laboratory, Sheffield) said that the practice of analysing standard samples concurrently with batches of work not only showed the analyst how his work was proceeding, but also tended gradually to eliminate the personal factor; it also gave confidence to a less experienced analyst. It was important that only those analysts who were actually dealing with the class of material should be asked to make the analysis. The Department was unfavourable to imposing unification of analytical methods, as it would cause inconvenience and lead to errors gravitating always in one direction.

LIVERPOOL.

A meeting of the Liverpool Section was held at the University on November 29, the chair being taken by Mr. John Gray in the absence of Mr. A. T. Smith. Before proceeding to the business on the agenda Dr. Kay spoke on the subject of the formation of a Chemists' Club in Liverpool. The proposal was well received, and a committee, consisting of three members of the Liverpool sections of the Society of Chemical Industry, Institute of Chemistry and the British Association of Chemists, was appointed to go into the matter and see whether suitable accommodation could be obtained.

Mr. W. Ramsay then exhibited and gave a brief description of the Pointolite Lamp for micro-metallurgical and other microscopical work, and also the Michell Viscometer for oils, etc. The latter instrument enables the viscosity of an oil to be determined with great rapidity and accuracy, and has the further merit that only a very small quantity of oil is required for the determination.

Dr. A. Holt read a paper on Tyrian Purple. This ancient dye stuff, so greatly valued in classical times that the search for raw material from which to obtain it had quite a marked influence on the discovery of the maritime regions of the ancient world, was obtained from various mollusks. Large deposits of the shells of these animals are still found in the neighbourhood of the ancient dye works. A description of the method by which the dye was extracted and used at Tyre and Sidon was given, as well as the corresponding methods employed by the ancient Aztecs and Peruvians in the new world. Modern investigations into the chemical nature of the dye by Schunk and Friedländer were described, including the method of extraction of the pure pigments (6 : 6 dibromindigo) adopted by the latter chemist. Dr. Holt then briefly reviewed the work on the purple obtained from the worm *Bonellia* by Sorby, and the investigation he himself had carried out on the pigment of the Ascidian *Diazona* which was also found to contain a dibromindigo closely related to the true Tyrian Purple. In conclusion the little that is known as to the physiological aspect of these pigments in the animal organism was reviewed.

LONDON.

The December meeting was held at Burlington House on the 2nd inst., Dr. Charles A. Keane presiding over a very full attendance.

The first paper was by Dr. H. G. Colman and Mr. E. W. Yeoman on "Commercial Concentrated Ammonia and its Impurities." Commercial concentrated (25 per cent.) ammonia, largely manufactured as an "intermediate" for the preparation of ammonium salts, usually contains a considerable amount of the volatile impurities of the crude ammoniacal liquor from which it is obtained. From a large number of analyses of samples of such concentrated liquor from different sources, it was found that in a normal liquor these impurities vary between the following limits (in grms. per 100 c.c.):—Hydrogen sulphide 0 to 0·9, phenols 0·11 to 0·37, pyridine bases 0·21 to 0·32, ammonium thiosulphate 0·08 to 0·25.

In addition, cyanogen derivatives are present, as cyanide, ferrocyanide and thiocyanate, being formed chiefly from the hydrocyanic acid, and to a smaller extent from the carbon bisulphide almost always evolved with the ammonia in distilling the crude liquor; and these are objectionable, especially in the manufacture of ammonium nitrate. The quantities found were as follows (grms. per 100 c.c.):—Hydrocyanic acid, as ammonium cyanide 0 to 0·0054, as ammonium ferrocyanide 0 to 0·0415, as ammonium thiocyanate 0 to 0·0578; total hydrogen cyanide 0 to 0·0822.

Different methods suggested for the better removal of cyanogen compounds in the manufacture were discussed, and also the methods of analysis, these last being substantially as given by Linder for the analysis of crude ammoniacal liquor, with such modifications as are necessitated by the higher percentages of ammonia and lower amounts of impurities in the concentrated liquor.

The second paper, by Mr. F. Butler Jones on the analysis of commercial "pure" benzols, dealt with the extraction of carbon bisulphide, thiophen, toluene, and paraffin, which occur in general only in very small quantities. The corresponding rises of the freezing point of the sample occasioned by the successive removal of carbon

bisulphide and of thiophen, are proportional to the quantities of these impurities. The toluene and paraffin are estimated from consideration of the extent by which the freezing point and the specific gravity of the residue, freed from carbon bisulphide and thiophen, are lower than the corresponding properties of pure benzene. A graph is provided whereby the volume percentage of each impurity may be read directly from the observed measurements.

"The Analysis of Aluminium Alloys and Metallic Aluminium" was the subject of the contribution by Dr. J. J. Fox, and Messrs. F. R. Ennos and E. W. Skelton. As the nature of the analytical process to be adopted depends upon the composition of the material, the alloys are arranged in three classes: (1) Metallic aluminium, in which no single impurity exceeds 1%. (2) Alloys containing copper up to 13%, zinc nil to 3%, tin nil to 3%, and possibly manganese, nickel and magnesium. (3) Alloys containing zinc up to 20%, copper up to 5%, and impurities not exceeding 1%. Two main methods were discussed. In the first—for classes (1) and (2)—lead and manganese are determined in separate portions by treating the alloy with 10 per cent. caustic soda solution. In the insoluble portion lead is estimated as sulphate and manganese by means of sodium bismuthate. In the second method—for class (3)—the metal is dissolved in nitro-sulphuric acid, and silica and lead sulphate filtered off. Copper is then determined electrolytically in presence of hydrogen peroxide, whereby bright deposits are obtained and no nitrogen compounds are left to interfere with the subsequent electrolytic determination of the zinc. After the removal of Group II. metals, a little tartaric acid and excess of caustic soda are added and the zinc and iron electrolysed out together on a rotating, gold-plated platinum electrode. The deposit is dissolved off the electrode in dilute sulphuric acid and the iron titrated with permanganate. This method is much more rapid than any involving the separation of zinc as sulphide.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

The November meeting of the Society was held in Leeds, on the 20th. Mr. F. W. Branson occupied the chair. The first paper entitled "Silica Refractories for Glassworks Use" was read by Mr. W. J. Rees. After having outlined the various uses to which silica refractories could be put in glassworks, the author dealt with the raw materials required and the methods used in the manufacture of silica bricks. The presence of iron in the form of magnetic oxide is not detrimental to the properties of a silica brick. The lowest silica limit was put at 94 per cent., and it was shown that the presence of much alumina or more than 2 per cent. of lime was not advisable. Lime is certain to be a constituent of the silica brick as lime slurry is used as a "bind." In some cases lime has a bleaching action and masks any colour likely to be caused by iron compounds. Some users of silica bricks insist on a white or light-coloured brick and reject dark-coloured reddish bricks, but the colour of a brick bears no relation to its refractoriness.

The texture of silica bricks may be either coarse or fine, but it must be uniform throughout. Although coarse-textured bricks are better for withstanding sudden temperature changes, they are more liable to attack by chemical fumes. Great advantage is gained in the manufacture of bricks if 25 per cent. of the materials is in the form of impalpable silica powder and the remainder in the form of grains with a maximum diameter of 0·25 in.

The various modifications of silica were discussed and the volume changes taking place with rise of temperature received full treatment. In conclusion the author discussed silica cements which, he stated, should contain at least 92 per cent. silica, and should only be used as a wash.

The second paper on "The Properties of Soda Lime Glasses: (1) The Annealing Temperatures" by J. H. Davidson, S English, and W. E. S. Turner, was read by Dr. Turner.

A series of fourteen allied glasses had been made, beginning with a simple soda-silicate glass, and the effect on several of the properties of adding increasing amounts of lime had been studied. The batches used and the results obtained for the annealing temperatures were communicated. It was shown that the annealing temperatures increased with an increasing amount of lime. Increasing the lime percentage also improved the durability, and caused the glass to "set" quicker. A batch for a bottle glass was given, which showed little or no tendency to "crizzle," thus differing from the majority of soda-lime-silicate glasses.

The following papers were not read but will be printed in the Journal of the Society in due course:—"The Determination of Boric Oxide in Glass," by J. D. Canwood and T. E. Wilson; and "Note on the Use of Arsenious Sulphide as a Flux in Glassmaking," by J. H. Davidson.

COKE OVEN MANAGERS' ASSOCIATION.

Addressing the Midland Section at Sheffield on November 23, Mr J. A. Wilson described his process for eliminating the sulphur, present as bisulphide, from commercial benzol (this J., 1916, 885). The method consists, briefly, in washing with caustic soda at a temperature just below the boiling point of benzol. He gave the following details of a complete washing:—Fore-runnings charged to mixer 1241 gallons, sp. gr. 0·907, CS_2 8·83 per cent. First wash. Caustic soda, 715 gallons of 27·5° Tw. (=10·74 per cent.). Sp. gr. after run, 0·892. CS_2, 3·57 per cent.=59·55 per cent. reduction. Second wash. Treated spent liquor from first wash, 550 gallons. Sp. gr. after run, 0·885. CS_2, 0·396=35·96 per cent. reduction. Total bisulphide removed=95·51 per cent.

SOCIETY OF PUBLIC ANALYSTS.

At an ordinary meeting held on December 5, with Dr. S. Rideal in the chair, the following three papers were presented:—(1) "Recorder for Estimating Carbon Monoxide in Inflammable Gases," by E. K. Rideal and H. S. Taylor; (2) "The Estimation of Phenacetin and other Para-aminophenol Derivatives by Hypochlorous Acid," by A. D. Powell; and (3) "Effect of Morphine Concentration on the B.P. Method of Morphine Estimation," by H. E. Annett and Hardayal Singh.

(1) The instrument described has been devised for the purpose of determining the purity of the hydrogen used in ammonia synthesis, and is of the continuous recording type. The method employed is to pass the gas through a special oxidising chamber in which the carbon monoxide is catalytically and preferentially oxidised to carbon dioxide by means of a special supply of oxygen. The oxidised gases are brought into contact with a constant stream of a standard solution of lime water, and the carbon dioxide formed recorded automatically by changes in the conductivity of the solution of lime water.

(2) The author reviewed the defects of methods hitherto in use for estimating substituted phenetidine compounds, and proposed one based on the action between sodium hypochlorite and an acid solution of para-aminophenol. This method is

applicable to the estimation of phenacetin in admixture with such substances as caffeine citrate, salol, and acetanilide, and also to other *p*-phenetidine or *p*-aminophenol derivatives used in medicine, as well as developers in photography. Incidentally the method of estimation serves to distinguish metol and metol substitutes.

(3) The authors have carried out investigations which show that the B.P. method, originally devised for the analysis of opium containing about 10 per cent. of morphine, will, when suitably modified, give satisfactory results with smaller weights of opium, down to one quarter that suggested in the Pharmacopœia.

THE INSTITUTE OF CHEMISTRY.

At the November meeting of Council the formation of Local Sections at Birmingham, Swansea, and Dublin was confirmed. On the recommendation of the Finance Committee, it was decided to raise the annual subscriptions forthwith, as follows:—Fellows', from 21*s.* to 42*s.*; Associates', from 21*s.* to 31*s.* 6*d.*; Students' from 5*s.* to 10*s.* The increased income resulting therefrom will be mainly expended in the following directions:—The development of Local Sections; the payment of fares of country members of Council who attend at least four meetings annually; the development of the publications, *e.g.*, a more detailed Register, more frequent Proceedings, propagandist literature, lectures; the more complete organisation of the Appointments Register; the improvement of the library; and additional staff.

The Council directed that copies of the suggested scheme for a Government Chemical Service (*v.i.*), prepared by the Public Appointments Committee, be forwarded to the Government Departments concerned. This Committee also reported on the proposed Federation of Chemical Societies. Prof. H. E. Armstrong had communicated that it was not proposed that the Institute should become a constituent body of the Federal Council, but that it should be associated with the latter and represented on it, at the same time carrying out its duties in accordance with its Charter. The Council agreed to this proposal.

Nine new Fellows, 83 Associates, and 9 Students were elected.

The suggested scheme for a Government Chemical Service includes the following desiderata (abbreviated):—(1) The appointment of chemists should be based on a system of selection by properly constituted authority, and not by examination or nomination. (2) The final selection from the short list of approved candidates should be made by the head of the Government chemical establishment concerned. (3) The chemists should be graded as civil servants in the Higher Division, with status, emoluments and pension comparable with those of members of other technical and learned professions employed by Government. (4) Assuming efficiency, promotion up to a definite rank should be guaranteed, and made independent of the occurrence of vacancies. (5) Suitable titles should be allotted to the different ranks of chemists. (6) Definite salary scales should be laid down for all grades. (7) The secondary staff (not to be called "chemists") to be subdivided into (*a*) Chemical Assistants (Senior and Junior), who should be men of good education, but without full professional qualification; (*b*) Laboratory Assistants (Chief, Senior, and Junior), who should be able to perform simple chemical operations and assist the chemists in routine work; (*c*) Laboratory Attendants (Senior and Junior), who would do the work of caretakers, clean apparatus, etc., and have prospects of promotion.

DRIED MILK

And Some Considerations on Preservation of Milk by Heat.

The Foods Department of the Local Government Board has from time to time issued valuable reports many of which have contained matter of especial interest to chemists. The latest volume[1] issued from this department contains three sections, the first by Dr. F. J. H. Coutts "Upon an Inquiry as to Dried Milks, with Special Reference to their Use in Infant Feeding." Accompanying this is a section entitled "Some Investigations bearing on the Nutritive Value of Dried Milk" describing work carried out by Mr. G. Winfield on behalf of the Medical Research Committee, and a further section "On the Examination of Milk Powders at the Government Laboratory." This combined report provides perhaps the fullest and most complete information on the subject of dried milk which has yet appeared in English, although a monograph on somewhat similar lines has previously been published in France by Prof. Porcher, of Lyons.

Dr. Coutts gives a brief account of some of the principal processes used in the manufacture of dried milk but does not go into any great detail. In the bibliography, however, will be found references to published articles dealing with various manufacturing processes, and in an appendix is given a useful list of some patents concerned with processes for preparing dried milk. The section on the physical and chemical characters of dried milk summarises the information previously published on the subject and gives an account of original observations made by Dr. Monier-Williams in the Board's Laboratory. The series of analyses made at the Government Laboratory under the direction of Sir J. J. Dobbie included 88 samples of milk powder or similar products as they occur in commerce. In all 88 samples, obtained from 11 different countries, were examined, of which 26 proved to have been made from full cream, and 57 from skimmed or partially skimmed milk. A detailed examination was made of each sample and the tables provide a mass of information on the chemical composition of milk powders which will be found most useful by public analysts and others, who will also appreciate the notes on the analytical methods employed.

In the earlier literature on dried milk it seems to have been taken for granted that this substance was sterile, and although this idea was soon abandoned comparatively little had been published on the bacteriology of dried milk. Whilst briefly noticing previous work on the subject the bacteriological section of the report is based mainly on special investigations carried out for the Board by Prof. Delépine and by the Lister Institute of Preventive Medicine. In the volume under consideration Prof. Delépine's results are merely summarised, as they had been previously published in a separate volume.[2] The conclusions to be drawn from his researches are: (*a*) That the drying of milk materially reduces the number of bacteria present, but does not give an absolutely sterile product. (*b*) That a considerable proportion of the bacteria found in dried milk has been re-introduced in the concluding stages of the processes. (*c*) That while most pathogenic organisms are destroyed by the process of drying, tubercle bacilli are not with certainty destroyed although they are attenuated in virulence.

[1] Reports to the Local Government Board on Public Health and Medical Subjects. New Series, No. 116, Food Reports, No. 24, 1918.

[2] Report to the Local Government Board upon the effects of certain condensing and drying processes used in the preservation of milk upon its bacterial contents, by Dr. S. Delépine. New Series, No. 97, Food Reports, No. 21, 1914.

The investigation carried out by the Lister Institute involved the detailed examination of 42 samples of commercial dried milk with a view to the estimation of the number of micro-organisms present which were capable of growing aerobically or anaerobically at 22° C. and at 37° C. It also included an examination for the presence of *streptococci*, of bacteria of the *Bacillus coli* type, of *B. enteritidis sporogenes*, and of tubercle bacilli. In no instance was a sample found to be sterile but the numerical count varied widely in different samples. The great variations indicate that care is not always taken to secure the greatest possible freedom from bacterial contamination. In no sample was the tubercle bacillus found to be present, but the comparative frequency of occurrence of *streptococci* and of *B. enteritidis sporogenes* and in some cases of coliform bacilli was not satisfactory. Dr. Coutts emphasises the importance of securing a better and more uniform bacteriological quality of dried milk. To this end special precautions should be taken to avoid the re-contamination of the milk during the concluding processes of its manufacture, and generally scrupulous cleanliness should be observed in the factories.

A short section of the report deals with administrative considerations such as the bearing on dried milk of the Sale of Food and Drugs Act and of the Milk and Cream Regulations, and discusses what requirements might usefully be imposed with regard to dried milk. The opinions expressed by Dr. Coutts are very favourable to dried milk for infant feeding. He considers that, generally speaking, it is one of the most useful of all the available preparations of cow's milk. The report is the third of a series dealing with infant foods which Dr. Coutts has submitted to the Board; the first dealt with condensed milks,[3] the second with proprietary infant foods.[4]

Closely allied in subject are two reports made to the Local Government Board by Dr. J. L. Claypon, one dealing with the value of boiled milk as a food for infants[5] and the other with the biological properties of milk considered in relation to the feeding of infants.[6] These five reports contain a large mass of useful information bearing on the important subject of infant feeding. The conclusions may be summarised thus:—

(1) Breast feeding is the only really satisfactory method for rearing infants. (2) If breast feeding is impossible, cow's milk in some form or other is one of the best available substitutes. (3) Fresh cow's milk is often heavily contaminated with bacteria and may consequently be dangerous for infants. (4) Apart from bacterial contamination, fresh cow's milk is not infrequently badly borne by infants, mainly on account of the hard clot formed in the stomach. (5) Boiled cow's milk, unsweetened full cream condensed milk, and full cream dried milk are often better borne than fresh cow's milk and give satisfactory results as regards nutrition. (6) Sweetened full cream condensed milk, if diluted to give a suitable proportion of sugar, is deficient in fat for baby feeding, whilst if diluted to give the right proportion of fat, it contains too much sugar. (7) Sweetened skimmed condensed milk is not a suitable food for infants. (8) The starchy proprietary foods are not suitable for infants under 7 months of age.

The series of reports above referred to may be further considered as a contribution to the subject of milk preservation.

[3] Reports to the Local Government Board, etc. New Series, No. 56, Food Reports, No. 15, 1911.
[4] Reports to the Local Government Board. New Series, No. 80, Food Reports, No. 20, 1914.
[5] Reports to the Local Government Board. New Series, No. 63, 1912.
[6] Reports to the Local Government Board. New Series, No. 76, 1913.

The preservation of milk by heat includes such processes as boiling, pasteurisation, sterilisation, condensing and drying. In all these processes certain physical and chemical changes occur which, being due to the action of heat, are probably similar in all the various processes, the degree of change being dependent upon the temperature reached during the process and on the length of time during which the milk is exposed to a high temperature.

Boiling is, of course, one of the simplest methods for preservation of milk but its efficacy is only temporary. Pasteurisation is a term which is rather loosely employed, neither the temperature reached during the process nor the period of exposure to heat being uniform. There are two main methods of pasteurisation; in one a bulk of milk, continuously stirred, is heated to between 70° and 80° C. and maintained for some time at that temperature. In the other—"continuous pasteurisation"—milk is passed through a series of steam-jacketed tubes at such a rate that before it leaves the heater its temperature is raised to about 86° C. In this method it is clear that all particles of the milk are not exposed to the same temperature for the same length of time. Sterilisation consists in heating milk in closed vessels to a temperature above the boiling point and maintaining this temperature for 20 minutes or more. Sterilisation may be applied to uncondensed milk, to partly condensed or "evaporated" milk and to fully condensed unsweetened milk. It is not necessary for fully condensed sweetened milk whether full cream or skimmed.

The process of condensing milk is carried out under reduced pressure and therefore at a temperature considerably under boiling point. It has, therefore, been suggested that condensed milk may retain certain properties which are destroyed by pasteurisation or sterilisation. But, in practice, milk is pasteurised before being condensed and similarly a pasteurising process is carried out before drying milk by the "spray" process. In effect, therefore, all these processes of heat preservation of milk include exposure of the milk to a temperature exceeding 70° C. for a considerable period or, in the case of dried milk made by the "hot cylinder" process, exposure to a temperature exceeding 100° C. for a short period.

The changes produced by heat affect the salts, soluble salts of calcium being rendered insoluble. This modifies the reaction of the milk to rennet. A slight loss of phosphorus and of citrates is said to occur. With regard to proteins, coagulation of albumin and of globulin occurs if the temperature is high enough. Caseinogen is not coagulated but it is supposed to be more digestible after heating, possibly owing to some alteration in the constitution of the protein molecule. Changes in the fats are slight. The lecithins are altered but the exact nature of the change is not known. Ferments present in milk are destroyed by most of the methods of preservation of milk by heat, but the reports of Dr. Claypon indicate that their loss does not lessen the food value of milk, even for infants. Vitamines are not entirely destroyed by short exposure of milk to temperature above the boiling point. Prolonged heating probably lessens the nutritive value of milk.

The Institute of Metals.—A general discussion on "The Relation of Science to the Non-Ferrous Metals Industry" will form the central feature of the forthcoming Annual General Meeting, at which there will also be presented several important papers, the publication of which has been withheld owing to the operation of the Censorship. The Annual May Lecture will be delivered by Prof. F. Soddy on the subject of "Radioactivity." A ballot for the election of members will be taken on December 18 next.

NEWS AND NOTES.

AUSTRALIA.

Zinc and Copper Production.—According to official advices, the first unit plant of the Electrolytic Zinc Company at Risdon, Tasmania, is now running continuously and producing 90 tons of high grade zinc weekly. Plans are under consideration to treat 250 tons of zinc concentrates and to produce 100 tons of electrolytic zinc daily. It is reported from Newcastle (N.S.W.) that an English company with £5,000,000 capital, intends to establish works for smelting copper and drawing copper wire.

NEW ZEALAND.

The Kauri Gum Industry.—The total quantity of kauri gum exported from New Zealand in 1916—17 was 4862 tons valued at £300,271. Prior to the war large amounts of all grades of the gum were exported to Germany, but at the present time the United States is the chief consumer, and a certain proportion is also sent to Japan. In 1914 a Government superintendent of the industry was appointed, and since then methods for freeing the gum from dirt, and for extracting the oil from the dirt in which the gum is imbedded have been devised. The method of separating dirt from the gum, discovered in 1917, consists in immersing the product in a strong solution of common salt, in which the gum will float, while part of the dirt subsides, the remainder being made to deposit by removing the enclosed air by means of an air pump. For extracting oil from the layer of dirt in which the "chip" gum is imbedded, a system of double distillation has been introduced, whereby from 85 to 90 per cent. of the total oil is separated, at a cost of about 4*d*. per gallon. It is estimated that the swamps where the chip dirt has not been destroyed by fire are capable of yielding per acre 1000 tons of dirt of the first quality, giving 73 galls. of oil per ton, which when refined and fractionated would be worth 3*s*. per gallon, and at least as much more of a lower quality. The timber from the swamp is also rich in oil, which may be extracted by the same process. It is estimated that the total quantity of oil from the timber and the chip dirt in the richer swamp land would possibly be 200,000 galls. per acre.—(*Bd. of Trade J., Nov.* 28, 1918.)

SOUTH AFRICA.

"Sengite"—A New Explosive.—A new explosive called Sengite is being made for mining purposes at Johannesburg. It resembles tonite, but sodium nitrate is substituted for barium nitrate, and the product is of strength approximately equal to gelignite. The ingredients are cleaned, sieved, blended, and pressed hydraulically into cartridges under a pressure of from 5 to 10 tons to the square inch, sufficient water being left in to make the cartridges perfectly safe to handle without reducing their blasting strength. A sengite cartridge cannot be detonated like tonite or gelignite, but will detonate regularly with a primer cartridge of gelignite or gelatine let into a recess.

The explosive has passed a rigid test, and a plant is being constructed at Johannesburg to turn out 5000 cases per month. Derivatives of sengite can be made to take the place of a series of gelignites and dynamites down to the strength of 30 per cent. nitroglycerin explosives. Sengite costs a little more than gelignite, and it will therefore only be used as a substitute for nitroglycerin explosives during the glycerin shortage. The first four letters of sengite are the initials of "Substitute explosive, no glycerin."—(*S. Afr. J. Ind., July*, 1918; *U.S. Com. Rep., Oct.* 21, 1918.)

CANADA.

Beet Sugar Production in Canada.—Canada's production of beet sugar for 1918 is estimated at 17,000 tons. This is considerably larger than the 1916 and 1917 yields, which stood at 12,500 and 11,250 tons respectively, but is slightly under the yield of 17,641 tons in 1915.

Industrial Alcohol Manufacture.—A new company, under the name of The Canadian Industrial Alcohol Co., Ltd., has been incorporated to carry on business as distillers and dealers in industrial alcohol, with a capital of $5,000,000. The assets of the H. Corby Distillery Co., of Corbyville, Ont., have been acquired.

Glassware Importations.—For the fiscal year ending March 31, 1918, the value of Canada's imports of glass and glassware was $5,238,921. In 1912 the imports of glass from all sources amounted to $4,100,286. In 1913, however, the high-water mark was reached, when the figure given was $5,370,431.

Sulphite Pulp Plant.—A plant capable of producing 200 tons of sulphite per day is being erected at Beaver Cove, in the Province of British Columbia. The manufacture of tannic acid from hemlock bark will also be undertaken, this industry being a pioneer venture for British Columbia. The production of sulphite in 1916 was 14,380 tons, and nearly three times as much in 1917.

Control of Chrome Ore.—By an Order-in-Council dated October 12, the War Trade Board was authorised to take possession of and control for a period of five years all chrome ore areas in Canada, compensation therefor to be determined by the War Trade Board subject to an appeal to the Exchequer Court of Canada. This action is the result of the shortage of chrome ores for the essential requirements of Canada and allied countries.

Straw Gas as Fuel.—Dr. McLaurin, professor of chemistry in the University of Saskatchewan, Saskatoon, is investigating a project for utilising the waste straw of Western Canada by the process of carbonisation. In reporting on the matter to the Hon. Advisory Research Council, he stated that in the three prairie provinces about 20,000,000 acres are under crop, and, assuming that there is one ton of straw per acre—a very conservative estimate—the amount of fuel would be 20,000,000 tons, which, when carbonised, would yield a total energy of 2,511,000 h.p. The inventor of the equipment for the production of gas from straw is G. Harrison, of Moose Jaw, Sask.

The Wood Distillation Industry.—Although much acetone will be prepared by the direct glucose fermentation and by the calcium carbide process, yet the older pre-war method is more than likely to survive. The wood distillation industry has been much stimulated by war activities, and one company alone—the Standard Iron and Chemical Co. of Canada—is producing 1,300,000 gallons of wood alcohol annually. The demand for this material is considered likely to expand. In the west of Canada much formaldehyde is being used as a preventive of smut in grain; and in Ontario and Quebec a somewhat unexpected demand has arisen for charcoal in connexion with the new nickel refining plants there in operation.

The Dextrin Industry.—Since dextrin has been placed on the list of prohibited exports from the United States, a demand has been created for the Canadian-made product. In 1915, J. and T. Battle, of Thorold, Ont., became the pioneer manufacturers of dextrin for the Dominion of Canada. At the outset the industry was handicapped by the relatively low duty on the finished product and the higher duty levied on corn starch, from which dextrin is made. It is estimated that Canada's consumption of this adhesive is about 700,000 lb.

a year, and there would appear to be a sufficiently large field for a Canadian industry to be maintained permanently after the war.

Expansion of Pulp and Paper Industry.—Dr. J. S. Bates, of the Forest Products Laboratories, states that the pulp and paper industry has expanded very rapidly in Canada during the past ten years, and that it would appear that Canada is destined to become perhaps the leading country in the world in the manufacture of pulp and paper products from wood. This is largely because of the extensive natural resources of water-powers and suitable tree species. Canada now has a total of about 90 mills, many of which are large and of modern design. The export figures for 1916 show that pulp wood, wood pulp and paper have increased to nearly half the total export value (approximately $100,000,000) of all forest products, with the exception of the small proportion of specially manufactured articles. The soft woods are the most important species for paper-making. Of these, spruce and balsam fir take the lead, with hemlock, jack- pine, tamarack and other conifers coming into more extensive use. The "soft hardwoods," represented by poplar and basswood, are available for making soda pulp, and a variety of hardwoods, such as birch and maple, is used in smaller quantity. In 1915 the total reported pulpwood consumption amounted to 1,405,836 cords with an average value of $6·71 per cord.

GENERAL.

Gas Warfare.—In a letter to *The Times* of November 29, eight of our leading medical men urge the desirability of measures being taken at the Peace Conference to put an end to the use of lethal gases in warfare. They summarise their arguments as follows:—"It is an uncontrollable weapon, whose effects cannot be limited to combatants. It is an 'unclean' weapon, condemning its victims to death by long-drawn-out torture. It opens the door to infinite possibilities of causing suffering and death, for its further development may well lead to the devising of an agent which will blot out towns, and even nations."

National Union of Scientific Workers.—The constitution of the Union was determined recently at a general meeting attended by representatives from 10 branches, comprising some 500 members. The objects are:—(1) To advance the interests of science, pure and applied, as an essential element in the national life. (2) To regulate the conditions of employment of persons with adequate scientific training and knowledge and their relations to their employers and other employees. (3) To secure in the interests of national efficiency that all scientific and technical departments in the public service and all posts involving scientific knowledge shall be under the direct control of persons having adequate scientific attainments. (4) To promote and encourage scientific research in all its branches. (5) To obtain adequate public endowment for research and to advise as to the administration of such endowment. (6) To set up an employment bureau. (7) To secure representation on the Whitley industrial councils and other bodies dealing with scientific occupations. (8) To examine and support all judicious schemes of scientific education. (9) To promote by corporate action the economic welfare of its members.

Since by the adoption of these objects the Union constituted itself legally a Trade Union, it was decided to take advantage of the administrative conveniences resulting from registration as such.

Applicants for admission must be 21 years of age, be normally engaged in work demanding scientific training, and have passed an examination qualifying for a degree or diploma in science, technology or mathematics at a recognised institution, or its equivalent.

The first president is Dr. O. L. Brady (Woolwich), and the secretary (*pro tem.*), Mr. E. Sinkinson, 14A Albert Bridge Road, S.W. 11.

National Factories.—According to the Tenth Report of the Select Committee on National Expenditure, the number of national factories for the production of munitions, instituted or taken over by the Ministry of Munitions, now amounts to 302. In all cases the original capital expenditure and the whole working cost have been borne by the Ministry. The factories vary greatly in size and importance, ranging from small saw mills and box-making factories, costing £1000 or less, to the propellant factory at Gretna, the capital cost of which was nearly £9,000,000. The total capital expenditure of the Ministry on 257 of these factories was £52,431,085 up to March 31, 1918, and a further expenditure of about £12,000,000 has been incurred since that date.

The Committee is satisfied that the policy of instituting national factories has, on the whole, borne good fruit. Although the cost of production in national factories may have been higher than the lowest ascertained for commercial firms, massed production has undoubtedly made for economy, and the estimated profits show that in a large number of cases the national factories have more than paid for themselves.

Fuel Economy in Switzerland.—At the annual meeting of the Swiss Union of Gas and Water Engineers, the papers dealt chiefly with the coal and gas problems and the means of combating the prevailing scarcity of fuel. The separation of water from tar at the gasworks is now effected by centrifugal machines, which reduce the water content from 60—70 per cent. to 5 per cent. Dr. P. Schläpfer, Director of the Federal Fuel-Testing Station at Zürich, spoke on the fuel question. Of native Swiss fuels, the anthracite of Wallis contains much ash, is very dense, poor in hydrogen, and burns badly unless finely divided or briquetted. The output up to July 31 was 21,000 tons. The coals of the Tertiary strata are more suitable for gas-making, but have a high percentage of ash and sulphur. The output this year, up to July 31, was 14,000 tons. The slaty coal of Zell, Uznach, etc., is more like peat, and about 31,000 tons was raised in the same period. There is much peat in Switzerland, but it is of very variable quality; in the same field the ash may vary from 2 to 20 per cent. and the thermal value by 10 per cent.

Water-gas is in use at the Zürich municipal gasworks; wood and peat are being employed for gas-making, and the poor gas is being enriched with acetylene.—(*Schweiz. Bauzeit., Sept.* 21, 1918.)

Wolfram Production in Austria-Hungary.—The stoppage of over-sea imports during the war has caused the re-starting of abandoned wolfram mines, and a search for new deposits. In 1917, 93,000 tons of wolfram ore was raised in Zinnwald in Bohemia, most of which was sent as raw material to works in Saxony. Before the war the quantity of ore raised was negligible.—(*Metall u. Erz, Sept.* 8, 1918.)

Future Production of Copper in Sweden.—Recently discovered deposits of copper at Jovattensdal (South Lappland) are believed to contain a high percentage of sulphur and copper pyrites. Government concessions have been made in the neighbourhood of Värdofälle, and further prospecting is being carried on near Börgsfjall, and in the Undersäker district, where rich copper and nickel deposits have been located.—(*Metall u. Erz, Sept.* 8, 1918.)

Discoveries of Iron Ore in Russia and Poland.—Deposits of considerable magnitude assaying 58 per cent. of iron have been discovered in the Government of Kursk. Peat and lignite are found in the neighbourhood. Work has already been started on the erection of blast furnaces, and production is promised for early next year. Large iron deposits have also been found on the western border of the Wietun chain of hills, on the Czenstochau-Olkusz road.—(*Z. angew. Chem., Oct.* 11, 1918.)

The Japanese Iron Industry.—The Acting British Consul at Nagasaki reports that the Nagasaki Iron Works Co. is forming an additional company with a capital of £1,000,000, for the purpose of erecting smelting plant to produce 50,000 tons of pig iron per annum. The output will at first be sold as such, but it is proposed to manufacture steel later on. The main supply of ore will be obtained from the Yangtse Valley and Corean ore will also be used. Kyushu coal together with some Chinese coal will be used for producing the coke. The plant will be completed in about a year, will consist of a smelting furnace producing 150 tons per day and a coke furnace, and is expected to cost about three-quarters of the total capital. (See also this J., 1918, 382 R.)—(*Bd. of Trade J., Nov.* 7, 1918.)

Iron-ore Deposits in Celebes.—Valuable iron-ore deposits have recently been discovered in the Malili district of the island of Celebes (E. Indies). They consist of lateritic iron ore, rich in nickel and chromium, which lies on the surface of an enormous plain. The deposit is from 46 to 49 feet thick, and the amount is estimated to be 1000 million tons. The natives are good workers, water power is abundant, and transport to the coast along the Malili River easy. The ore contains 25 per cent. of nickel; New Caledonian ore contains not more than 7 per cent. The pre-war price of a ton of Caledonian ore was £21 10*s.*; the present price is about 3 times as much.—(*U.S. Com. Rep., Oct.* 15, 1918.)

Manganese in West Africa.—At a recent meeting of the United Exploration Co., Ltd., some further particulars were given concerning the new manganese deposits in West Africa (this J., 1918, 57 R). The outcrops apparently extend for about 3 miles, and at one place they appear to be duplicated for half a mile. The amount of ore shipped in 1917 was 30,275 tons and from Jan. 1—Nov. 16, 1918, 21,290 tons. Provided adequate tonnage be forthcoming, it should be possible to ship from 5000 to 10,000 tons a month during 1919. Given better transport facilities, these deposits should meet most of England's requirements of manganese for many years to come.

Manganese Ore near Chihuahua, Mexico.—Owing to the present high price of manganese ore ($18 (£3 14*s.*) per ton f.o.b. Chihuahua) more than 50 claims have been registered during the last three months. The ore is in a cretaceous formation within a zone of 20 miles round Chihuahua city, and the shipments to the United States, which began in September, 1917, now amount to about 350 tons monthly. Ores of lower than 40 per cent. manganese are not accepted. Mexican manganese is associated with silver in the States of Puebla, Chiapas and Lower California; but in the Chihuahua district it occurs as pyrolusite, psilomelane and wad, with iron and small quantities of gold.—(*U.S. Com. Rep., Oct.* 26, 1918.)

Silico-manganese in the U.S.A.—Silico-manganese is now being manufactured in America on a commercial scale. Although consumed regularly, and in considerable quantities, by several important steel companies, nearly all the requirements have hitherto been imported, but importations ceased with the outbreak of war. To cope with the demand, the Pacific Electro Metals Company has erected a new electric furnace plant at Bay Point, 30 miles from San Francisco. In the first place silico-manganese containing 20 to 25 per cent. silicon, 50 to 55 per cent. manganese, and about 1 per cent. carbon, is being produced. Later, a higher grade containing 25 to 30 per cent. silicon and 65 to 70 per cent. manganese, will also be made, and the manufacture of other ferro-alloys commenced. The company's output of ferro-alloys is estimated at not far short of 1000 tons a month.—(*Iron and Coal Tr. Rev., Nov.* 8, 1918.)

Ferro-Manganese in the U.S.A.—Before the war the United States produced less than one-half of its ferro-manganese requirements, in 1914 only 54 per cent., but in 1917, 83 per cent., and over 90 per cent. is expected for 1918. The total produced and imported increased from 183,728 tons in 1914 to 331,381 tons in 1917. In 1914 the manganese ore production—2635 tons—was insufficient to make 0·5 per cent. of the ferro-manganese required; in 1915 it was up to 2 per cent., in 1916 it was 3 per cent. of the increased demand, and in 1917 it was 113,734 tons, or over 10 per cent. of that required. During July, 1918, 30,370 tons of 65 per cent. ferro-manganese and 25,021 tons of 20 per cent. spiegeleisen were produced, containing a total of 24,924 tons of metallic manganese, of which 48 per cent. was obtained from domestic ores. To aid in the conservation of shipping, the use of silico-manganese derived from highly silicious domestic ores is suggested. The following advantages are claimed for it:—(1) It is a better deoxidiser than either element alone. (2) The combined oxides can be more readily eliminated than either alone. (3) The silicon tends to keep the carbon low.—(*Bd. of Trade J., Nov.* 21, 1918.)

Graphite in the U.S.A. in 1917.—The greatly increased demand for graphite crucibles, as a result of the war, has caused a marked increase in the production of American flaked graphite. For crucibles, the graphite should contain at least 85 per cent. and preferably 90 per cent. or more of carbon, and it must be free from mica, pyrite and iron oxide. The grains or flakes should be coarse enough for them to be easily bound together by clay or other bond employed; the whole of the graphite should remain on a 100-mesh sieve and should contain a large proportion of flakes about 1 mm. in diameter. Most American makers of crucibles prefer to use a mixture of Ceylon graphite with 10—25 per cent. of American flake as the grains in the former are more cubical than the thin plates of the latter. The only American graphite resembling that from Ceylon occurs in Montana. The use of American clays instead of those formerly imported from Bavaria has now reached a satisfactory stage, but the Bavarian clays were much cheaper.

For lubricating purposes and for pencils a pure graphite is also required and it must be wholly free from gritty substances. For other purposes an inferior quality of graphite is usually satisfactory.

The amount of crystalline or flake graphite mined in the United States has shown a steady increase since 1914, and in 1917 amounted to 5000 (short) tons (valued at £200,000), the greater part of this quantity being obtained by 14 firms in Alabama, 4 in New York, 5 in Pennsylvania and 1 in Montana, with small amounts from California, Alaska and Texas. In the same year 24,575 tons were imported (some indirectly) from Ceylon, 4393 tons from Madagascar, and 3476 tons from Canada. About 8300 tons of amorphous graphite (valued at £14,000) were produced in 1917, nearly four times as much as in the previous year, chiefly in Colorado,

Michigan, Nevada, Rhode Island; and in addition 10,000 tons were imported from Mexico and Chosen.

The output of artificial graphite made electrically from anthracite or petroleum coke has greatly increased in recent years, on account of the remarkable growth of electro-chemical industries in which graphite electrodes are employed. In this connexion it is reported that the production of electric furnace steel in the United States is now about eight times that of crucible steel and one-eighth that of Bessemer steel, and that in 1917 there were 223 electric steel furnaces as compared with 136 in 1916. Artificial graphite is also used largely in lubricants, paints, foundry facings, boiler scale preventives and for filling batteries.

Owing to war regulations, licences from the U.S. War Trade Board are now required for all graphite imported into the country. In 1917, the export of unmanufactured graphite was treble that of the previous year, the bulk of it going to England, France, Canada and Italy, whilst that of the manufactured products (sent to the same countries and to Portugal) declined. Of the latter products, crucibles, electrodes, flake graphite and plumbago may not now be exported except by special licence.

The percentage ratio of American graphite to the world's production in 1917 was approximately 10; that of Ceylon being 27, Bavaria 40, Chosen 9, Italy 10, and Mexico and other countries 4.

Even at the present inflated prices, the American miners of graphite depend on the No. 1 and No. 2 flake for their profit, the dust and lower grade flakes being saleable at very low prices. In order to reduce the proportion of dust, oil flotation has been used—particularly in Alabama—with great success. Better milling methods would greatly aid the situation generally, especially in view of the keen competition which is anticipated in the near future from Madagascar. The enormous reserves of rich graphitic schists and abundance of water power and cheap labour, enable the Malagasy graphite to be placed on the London and New York markets for $2\frac{1}{2}d.$ per lb. in normal times, and there has recently been a most remarkable growth in the production of Malagasy graphite. It has been suggested by the U.S. Geological Survey that American producers should draw up specifications for two or three standard grades, based on the percentage of graphite carbon, with a guaranteed maximum of silica and iron and with limitations as to size of flake.—(*U.S. Geol. Surv.*, 1918.)

Coal Mining in Turkey.—The solitary coal-bed in Turkey is situated at Enekli (Heraklea) on the Black Sea. It is worked chiefly by two companies, the French "Société ottomane d'Heraclée" and the Belgian-German "Société anonyme des charbonnages réunis de Bender-Enekli." During the war the monthly production has decreased from 75,000—80,000 tons to 25,000—30,000 tons, in spite of the general shortage of fuel. The reasons given are:—the sub-division of the working into a number of small undertakings, all of which suffer from bad technical equipment; bad financial conditions; and labour shortage, for even in peace time it is only with difficulty that natives can be induced to go underground.—(*Z. angew. Chem.*, *Oct.* 4, 1918.)

Manufacture of Oak Tanning Extract in Holland.—Inability to import tanning materials from overseas has impelled several Dutch tanners to build small extracting plants at a cost of £4000 each. A dealer in oak bark has also started a plant on a much larger scale and with Governmental support. The capitalisation of this plant is £24,000 and some £10,000 has already been expended on its construction. It is thought that this factory alone will be able to supply about 5 per cent. of Holland's tanning-extract requirements. The raw materials used are the bark, wood, roots, and stumps of the oak.—(*U.S. Com. Rep.*, *Oct.* 31, 1918.)

Mineral Resources of the Isle of Pines (Cuba).—The Isle of Pines promises to become an important producer of iron, copper, and other ores; eleven mines have already been located, and two are being actively developed. In the neighbourhood of Nueva Gerona, fine iron ore is apparently being extracted, and samples have been sent for examination to the United States and Cuba. Operations will commence shortly at a copper mine in the same district, and development is expected in other areas as soon as their boundaries have been officially fixed.—(*U.S. Com. Rep.*, *Oct.* 10, 1918.)

Salt Industry for Iceland.—Plans are being discussed for the creation of a salt industry in Iceland. In 1914, a concession for 30 years for salt production was granted but little progress was made. It is now proposed to combine the salt production with the contemplated electric-power stations in Iceland, and with the mining and smelting of iron, whereby certain by-products of the iron industry could be utilised. In this way there would be a possibility not only of providing Iceland's own consumption of salt (100,000 tons) but also of exporting to Denmark.—(*U.S. Com. Rep.*, *Oct.* 22, 1918.)

Phosphate Deposits in the South Pacific.—Extensive phosphate deposits found in Nauru or Pleasant Island and Ocean Island (located between the Marshall and Solomon Islands) are said to be the most valuable of the kind in the world. The limestone has become impregnated with guano deposited by sea birds, and a formation of phosphate rock 40 feet in depth is the result. The quantity of phosphate available is estimated at 500,000,000 tons, and as a fertiliser it promises to rival the famous nitrate fields of Chile.—(*U.S. Com. Rep.*, *Sept.* 25, 1918.)

Utilisation of Beechnuts in Switzerland.—School children are to gather beechnuts in Switzerland, from which the authorities hope to extract 500 metric tons of edible oil. The beechnut tastes like hazelnut, and may be made into flour for bread; its oil does not become rancid.—(*U.S. Com. Rep.*, *Oct.* 28, 1918.)

The Bulgarian Rose Oil Industry.—In order to resuscitate this decaying industry, an influential and representative society has been formed with the following objects:—(1) To obtain cheap credit for its members; (2) to combat adulteration; (3) to centralise distillation; and (4) to supply members with all necessary appliances.—(*Z. angew. Chem.*, *Oct.* 15, 1918.)

Substitutes for Lubricating Oil.—Experiments have shown that hydro-naphthalenes, especially tetra-hydro-naphthalene, deka-hydro-naphthalene, and their intermediates may be used as substitutes for common lubricating oil. With the addition of fats or fat-oils they may be used to lubricate the finer parts of machinery. With or without the addition of mineral oil, they serve very effectively as lubricants for textile machines.—(*Chem. Zeit.*, *Sept.* 28, 1918.)

French Red Earthenware and Other Pottery.—The clays of northern and central France are employed in the manufacture of high grade pottery and china; those of south-western France are only used for coarser work. In the Bordeaux district, the chief centres of earthenware manufacture are in the Departments of Landes and Lot et Garonne, the former requiring large numbers of vessels for gathering and refining pine resins and keeping 2 large and 38 small factories employed in their manufacture before the war. The most approved material for these resin pots is a combination of clay, sand and cement known as "silico-calcaire," which is stronger and more impervious than baked burning clay. All except one of the 40 factories mentioned above are closed, and the demand is insufficient to reduce the existing stocks appreciably.

The clays and other shales of the Chalose dis-

trict are easily adaptable to ceramic work and large deposits of them still remain unexploited. The kaolin found in abundance at Gaujacq is utilised, and the white clay and felspar in that region are shipped to Vallauris for use in the manufacture of insulators and sparking plugs. The pottery made at Vallauris, near Nice, is chiefly used for culinary purposes, about 20,000 metric tons, valued at £140,000, being made annually before the war; at present less than half this amount is being produced, and is sold at more than double its former price. In the Havre district, Vosges pottery is almost exclusively used for horticultural purposes, but supplies are deficient. The bulk of the pots sold in Nantes was imported from Belgium, this source of supply was cut off by the war, and the demand has not been satisfied from any other source. Prior to the war, there were numerous small flower pot manufactories near Marseilles, but several of these are now closed and the present output is less than one-third of the normal. One factory has successfully manufactured earthenware articles for hospital use. In the Lyons and Limoges districts many of the works making flowerpots and coarse earthenware goods have been closed. The demand for this class of ware in the Rouen district was so small before the war that its manufacture locally had ceased and supplies were obtained from the Vosges.—(*U.S. Com. Rep., Sept.* 20, 1918.)

Consumption of Textile Colours in Russia.—In the year 1913 the Russian textile industry consumed 20 million puds (about 320,000 long tons) of cotton, for which the following quantities of dyes were used (in puds):—Vegetable colours 37,052, sulphur colours 110,694, mordanted dyes 34,572, hydrosulphite colours 31,154, lac dyes 15,447, discharge colours 15,864, alizarin 27,235. Total 340,640 puds (about 5500 tons). For 3,655,247 puds of woollen materials, 113,800 puds of dyes were used, and for the silken goods (213,878 puds), 22,672 puds. Wool and wool-dyes are now in most demand. Before the war the dyes were imported chiefly from Germany, and also from Switzerland, Holland and England, in the order named (1 pud = 36 lb. approx.).—(*Z. angew. Chem., Sept.* 27, 1918.)

The Potash Deposits in Erythrea.—In a short note to the *Rendiconti della R. Accademia dei Lincei*, M. Giua first refers briefly to the deposits of potash salts occurring at Stassfurt, Wittelsheim (Alsace) and elsewhere, and then proceeds to deal more at length with those found at Dallol in Southern Dancalia, in the Italian colony of Erythrea. These deposits, discovered since the outbreak of the European war, have already been worked on a considerable scale, large quantities of the salts having been despatched to Italy, as well as to France, England and even Japan. Both sodium and potassium salts are found: the latter appear at the surface of the ground and, although localised at certain points of the saline region, constitute enormous stretches of great value. In some of the samples examined the proportion of potassium chloride exceeds 98 per cent.; at Stassfurt salts of corresponding richness are obtained only at great depths. Of the potash and soda salts which have been analysed, but few specimens contain traces of bromide, whilst all show a low content of magnesium chloride. The latter also occurs at Dallol in hot springs, having a temperature of 80°—90° C. and consisting of saturated solutions of magnesium salts with traces of sodium chloride and appreciable amounts of magnesium bromide; at the ordinary temperature these waters set to a solid mass, coloured yellow by small proportions of oxide of iron. Solutions of magnesium chloride saturated at the ordinary temperature (about 40° C.) and containing bromine in marked quantities, are also found.

A SYSTEM OF FILING PAPERS, ETC., BY SUBJECT.

H. DROOP RICHMOND.

The reply to my criticism of M. de Whalley's system is a statement that a purely alphabetical system, such as I advocate, is unsafe, apparently because there is no record of the existence of a folder, and consequently there is danger of its being lost and duplicated (this J., 1918, 413 R). In practice, however, this danger is very small, and distinctly less than the danger of duplication of folders and consequent mislaying of information which occurs with a combination of an alphabetical and numerical system indexed numerically, it being easy to overlook any entry on a guide card if only entered numerically. I speak from experience, having discarded one system for the other.

I cannot agree that the possibilities in the last paragraph of my article are at all as applicable to the alphabetical-numerical system, for the simple reason that the space available for cross-references, etc., in the metallic tab system is occupied by the numerical index in the other system.

LEGAL INTELLIGENCE.

Superphosphate Contract Dispute. *A. Prescott* v. *Victors, Ltd.*—On November 18, in the Court of Appeal, before Lords Justices Bankes, Warrington, and Scrutton, the case of A. Prescott, trading as Prescott and Co., Hulme, *v.* Victors, Ltd., Manchester, was heard upon an appeal by the defendants from a decision of Mr. Justice Avory, affirming a decision of the District Registrar in Manchester, refusing to stay action under Section 4 of the Arbitration Act.

The dispute arose under a contract by which Messrs. Victors were the sellers of 20 tons of acid calcium phosphate to the plaintiff. Only 4 tons was delivered, and the sellers relied upon protective conditions in the contract as an excuse for not delivering the balance. There was a further dispute as to the quality of the phosphate delivered. The defendants' application to refer the dispute to arbitration was refused on the ground that they were not ready and willing at the time the action was commenced to do all things necessary for the proper conduct of the arbitration.

Without calling upon counsel for the respondents, their Lordships dismissed the appeal with costs.

Saccharin Contract Dispute. *H. Parker* v. *Messrs. Crisp and Co.*—In the Divisional Court, before Justices Coleridge and Avory, on November 22, Messrs. Crisp and Co., of Birmingham, appealed from a judgment of Judge Thomas at Liverpool in June last, in favour of plaintiff for £75 as damages for breach of contract to deliver 25 lb. of saccharin. The order had been given and the goods paid for on Budget day, but prior to the announcement of the increased duty of 60*s.* per lb. upon saccharin. The issue between the parties was as to who was liable for that increase.

In giving judgment, Mr. Justice Coleridge upheld the decision of the County Court judge, *viz.*, that there was a verbal contract to deliver the goods (at 310*s.* per lb.), and there was no agreement by which the plaintiff could be called upon to pay any increased price by reason of the imposition of the extra tax. The appeal was dismissed with costs.

Salicylic Acid Contract Dispute. *H. Batten and Co.* v. *R. Lane Hall and Co.*—A dispute between the above London firms with reference to the non-

delivery by R. Lane Hall and Co. of one ton of salicylic acid B.P. to the appellants, H. Batten and Co., was heard by Mr. Justice Sankey on November 25, the matter coming up on an award in the form of a special case stated by an arbitrator to deal with points of law arising. The latter had found that the buyers were entitled to receive £196 damages.

Counsel for the appellants said that his clients had approached Messrs. W. Everitt and Co., manufacturers, for the acid, but they were referred to Messrs. Lane Hall & Co., who described themselves as manufacturers, but who really were Messrs. Everitt's (sole) agents.

Respondents' case was that, under the contract, the buyers purchased salicylic acid of Everitt's manufacture, and that owing to unavoidable circumstances this manufacture was unprocurable, and therefore they were excused by a clause in the contract which allowed for possible breakdown of machinery, an event which happened.

His Lordship, giving judgment, upheld the award of the arbitrator, *viz.*, that the interference to the manufacture was not of such a substantial character as to entitle the sellers to suspend deliveries. A stay of execution was granted.

Wood Oil Shipment. *Mann and Cook* v. *Davies, Turner and Co.*—In the Commercial Court of the King's Bench Division on November 29, before Mr. Justice Rowlatt, an action was decided in which Messrs. Mann and Cook, of London, claimed £359 damages against Davies, Turner and Co., of London and Liverpool, for the alleged conversion of quantities of wood oil, representing part of a consignment of wood oil purchased by the plaintiffs from the Hong Kong Maritime Co., and shipped from Japan to the port of Liverpool in the steamship "Kashima Maru." The conversion was admitted, and the only point in dispute was the measure of the damages.

The case for the plaintiffs was that when the vessel arrived at Liverpool in September, 1917, they employed the defendants, Davies, Turner and Co., to act as their agents and receive the collected oil. A large quantity that had leaked from the casks had to be collected up. The plaintiffs in due course complained of shortage, and they were told that there was no more oil, but eventually it transpired that some 59 cwt. of the loose collected oil had been sold on the defendants' instructions. The sale realised £25 per ton. The defendants admitted the conversion through an error, but said that the oil was not of the value claimed (£120 per ton) because it had become mixed with fish and other oil and dirt.

After hearing evidence, his Lordship said that in his opinion the oil was not deteriorated by admixture with other oil, or dirt, or water. The plaintiffs were entitled to recover on the basis of £120 per ton, less 2½ per cent., and he gave judgment accordingly. He left the parties to decide the exact figure on this basis, subject to an allowance of £19 to the defendants for expenses, etc., of collection.

Application for Use of German Patents.—Before the Comptroller of Patents in the Patents Court, London, on November 28, an application was heard, brought by Messrs. C. B. Holliday and Co., Ltd., of Huddersfield, for a licence to use patents 18,822 and 2918 of 1909, owned by the German firm of Cassella. It was stated that they were for a hydron blue, which had been much required to dye cotton fabrics for use in the Navy. Later on application might be made in respect of five associated patents, 9689 and 14,143 of 1909, 22,138 and 37,051 of 1910, and 489 of 1911. The Comptroller intimated that the application would be considered.

GOVERNMENT ORDERS AND NOTICES.

PROHIBITED EXPORTS.

The Board of Trade has issued two further lists of articles upon which the hitherto existing export prohibitions have been relaxed. The lists appeared in the *Board of Trade Journal* for November 28 and December 5, and the relaxations came into force on December 6 and 13 respectively.

Headings to be transferred from one list to another.

From List A to List B:—

Cascarilla bark; colocynth; pyrogallic acid, and mixtures containing; senna leaves and pods; strophanthus seeds.—(Dec. 6.)

Aluminium and its alloys; aluminium powder; antimony and its alloys; antimony, sulphides and oxides of, and mixtures containing; ferro-manganese; ferro-silicon; nickel, its ores and alloys; oakum; silicon manganese; thorium and its alloys. —(Dec. 13.)

From List A to List C:—

Acriflavine, proflavine, and other acridine derivatives having antiseptic or therapeutic properties, and mixtures or preparations containing any of those substances; antipyrine (phenazone) and its preparations; citrate of iron and ammonium; iron, reduced; lycopodium; metol and mixtures containing; neo-salvarsan; salvarsan; tannic acid.—(Dec. 6.)

Aeroplane dope; galvanised sheets, corrugated or flat; ivory, vegetable, and manufactures thereof.—(Dec. 13.)

From List B to List C:—

Amidol and mixtures containing; amidopyrine; belladonna and its preparations; belladonna alkaloids and their salts and preparations; caffeine and its salts; citric acid; diethylbarbituric acid (veronal) and veronal sodium; emetin and its salts; guaiacol and guaiacol carbonate; phenacetin and its preparations; salipyrine; thymol and its preparations.—(Dec. 6.)

Nickel nitrate; nickel, oxides and salts of (except nickel ammonium-sulphate, which is prohibited to all destinations), and mixtures containing.—(Dec. 13.)

Altered Headings.

(A) Carborundum, alundum, crystolon and all other artificial abrasives and manufactures thereof; (C) emery and corundum and manufactures thereof (except such as are prohibited as parts of shoemaking machines); (A) platinum, alloys of platinum, and manufactures containing platinum; (A) steel containing tungsten or molybdenum; (C) tools or other articles made from steel containing tungsten or molybdenum; (A) steel containing chrome, cobalt, nickel or vanadium; (C) steel articles containing chrome, cobalt, nickel or vanadium; (A) thermometers, clinical; (C) thermometers not otherwise prohibited.—(Dec. 6.)

(A) Cartridges, charges of all kinds and their component parts except detonators; (C) detonators; (A) wire manufactured of copper or its alloys; (B) bars, circles, plates, rods, sheets, strip, tubes, manufactured of copper or its alloys; (C) copper manufactures not otherwise prohibited; (A) oils, fixed, all animal and vegetable, and articles and mixtures containing such oils, except indiarubber substitute and oil varnish; (C) indiarubber substitute; (C) oil varnish; (A) phosphorus compounds, except phosphorus sesquisulphide and triphenyl phosphate; (C) phosphorus sesquisulphide; (C) triphenyl phosphate; (A) steel plates and sheets, except black steel sheets less than one-eighth inch thick; (C) black steel sheets less than one-eighth inch thick.—(Dec. 13.)

Shipments to Italy. It is hoped that some shipping space will be available for cargo for private consignees. Applications for such shipments should be made through the usual business channels, but the consignees must hold the necessary import permits from the Italian Government.

Exports to Holland. The Director of the War Trade Department announces that export trade with Holland can now be resumed under licence, and that his Department is prepared to receive and consider applications for the grant of licences.

THE PETROLEUM PRODUCTS (WHOLESALE PRICES) NO. 4 ORDER, 1918.

This Order was issued by the Board of Trade on December 1, upon which date it came into effect. It defines the expression "wholesale dealer," prescribes wholesale prices for a number of petroleum products, and cancels the preceding Orders, Nos. 2 and 3, of 1918, and also the Petroleum Products (Contracts) Order, 1918. The products affected are: Spirit in cans: aviation, special boiling points, Nos. 1, 2, 3; kerosene: long time burning oil in bulk, No. 1, No. 2; raw white spirit as imported; gas oil; and fuel oil.

OTHER ORDERS.

The British Hides (Dealings) Order, 1918. Army Council, Nov. 25.

The Household Fuel (Prosecutions) Order, 1918. Board of Trade, Nov. 28.

The Motor Spirit and Gas Restriction (Amendment) Order, No. 2, 1918. Board of Trade, Dec. 1.

ALCOHOL AND GLYCERIN.—The Ministry of Munitions notifies that there are now supplies of alcohol available for industrial purposes, and that manufacturers should be able to obtain their requirements from their usual suppliers without restriction, subject to the usual regulations of the Board of Customs and Excise. Methylated spirit is again available to the public. Glycerin should be purchasable in the ordinary way from chemists and druggists, stores, etc. Arrangements have been made which enable glycerin producers to supply substantial quantities for general use.

DEALINGS IN CALCIUM CARBIDE.—On December 1, 1918, all restrictions on the sale or purchase of calcium carbide were removed, subject to a maximum price to consumers of £40 per ton for quantities of 1 cwt. and over (granulated 10*s.* per ton extra).

COMPANY NEWS.

THE EXPLOSIVES COMBINE.—The official particulars concerning the proposed amalgamation of explosives manufacturing companies have been issued in a circular letter addressed by the directors of Nobel's Explosives Co., Ltd., to its shareholders. The new company will be called Explosives Trades (Limited), and its authorised capital will be £18,000,000 made up as follows:—Six per cent. £1 cumulative preference shares, £6,500,000; £1 ordinary shares, £8,000,000; £1 deferred shares, £1,500,000; £1 shares, to be issued later on terms to be decided upon, £2,000,000. After payment of the preference dividend, the ordinary shares will receive a non-cumulative 10 per cent., and thereafter the deferred shares a non-cumulative 5 per cent.; the balance of profits will be partitioned between the ordinary and deferred shares in proportion to the amount paid on them. If, as is anticipated, the whole of the shareholders in the constituent companies decide to exchange their holdings, the issued capital will be:—Preference, £6,232,443; ordinary, £7,584,194; deferred, £1,430,821.

The boards of the following 29 companies have passed resolutions in favour of the scheme:—Alliance Explosives Co., Australian Explosives and Chemical Co., Bickford Smith and Co., Wm. Bennett Sons and Co., St. Helens Electric Fuse Co., Unity Safety Fuse Co., Birmingham Metal and Munitions Co., British Explosives Syndicate, British South African Explosives Co., British Westfalite, Cotton Powder Co., Curtis's and Harvey, E.C. Powder Co., Eley Bros., Eley Bros. (Canada), Abbey Improved Chilled Shot Co., Elterwater Gunpowder Co., King's Norton Metal Co., Kynoch, Kynoch-Arklow, National Explosives Co., New Explosives Co., Nobel's Explosives Co., Electric Blasting Apparatus Co., Patent Electric Shot Firing Co., Roburite and Ammonal, Sedgwick Gunpowder Co., Schultze Gunpowder Co., W. H. Wakefield and Co.

Sir Henry M'Gowan, managing director of Nobel's, will be chairman and managing director of the new company, and in addition there will be 17 other directors on the new board, most of whom are now chairmen or managing directors of the amalgamating firms. The circular letter also gives particulars concerning the proposed terms of exchange of old shares for new. The scheme has received the sanction of the Treasury.

BRITISH DYES, LTD., AND LEVINSTEIN, LTD.—The directors of British Dyes, Ltd., have announced their recommendation that the proposed purchasing company shall acquire the shares, and not the assets, of the two individual companies. An agreement to this effect has been approved. It is intended, at least for a time, to keep the companies as separate business entities, but they will work together and have the same directors. The price payable for the shares is to be ascertained on the same basis as was proposed for the purchase of the assets, and is to be satisfied by shares in the new company. It is proposed to call the purchasing company "British Dyestuffs Corporation Limited," and the two affiliating companies, "British Dyestuffs Corporation (Huddersfield) Limited" and "British Dyestuffs Corporation (Blackley) Limited" respectively.

It has not been found possible to issue a reliable balance sheet of British Dyes, Ltd., but substantial profits have been made, and the directors recommend the distribution of the full dividend authorised by the Government, up to October 31 last, the date of valuation of the company's assets for the purpose of the amalgamation.

LEVER BROS., LTD., AND SANITAS, LTD.—The terms of the impending affiliation between these two companies were explained at a recent meeting of the latter company by Mr. C. T. Kingzett, the chairman. The share capital of Sanitas, Ltd., is to be increased to £262,800 and the existing shares are to be converted into 9 per cent. cumulative preference shares. Messrs. Lever Bros., Ltd., will subscribe for £100,000 ordinary shares, and Sanitas, Ltd., will subscribe for £50,000 Lever Bros. 15 per cent. cumulative preferred ordinary shares.

LEVER BROS., LTD.—This company has recently offered a further £1,000,000 six and a half per cent. "B" preference shares, the money to be devoted to general purposes, but particularly to the development of the manufacture of margarine.

BRUNNER MOND AND CO., LTD., AND THE BUXTON LIME FIRMS CO., LTD.—The former company has arranged to take over the shares of the latter by

exchanging five of its £1 ordinary shares for each £10 share of the Buxton company.

The British Steel Corporation, Ltd., was registered on October 26 as a private company with a capital of £1,000,000 in £1 shares. The directors must be British subjects. The subscribers are:—Sir R. Vassar-Smith and Messrs. J. C. Davies, J. R. Wright, and R. Tilden Smith.

The British Metal Corporation, Ltd.—This company has been registered with a capital of £5,000,000 in 500,000 shares of £10 each. Foreigners may not hold more than 40 per cent. of the shares or 25 per cent. of the voting power, except with the permission of the Board of Trade. The Treasury has the right to be represented by one director, and at least three-fourths of the board must be British subjects resident in the United Kingdom. The principal objects of the company are:—"To regain and retain for British interests the predominance in the non-ferrous metal trades of the Empire usurped in recent years by German organisations. To secure for British manufacturers the raw materials needed for their trade. To afford the credits required by users of metals and ores and assistance to producers. To support and sustain the general trade of the United Kingdom in non-ferrous metals, and especially to maintain the position hitherto occupied by the market in London. To supplement the financial side of the business by carrying on research work. To develop and extend the mineral and metal production of the Empire, and to promote the well-being of every interest concerned in the trade."

REPORT.

Report on the Trade of the Dominion of New Zealand for 1917. By R. W. Dalton, *H.M. Trade Commissioner in the Dominion of New Zealand.* [Cd. 9175, *3d.*] London: H.M. Stationery Office.

The prosperity which New Zealand has experienced since the commencement of the war continued during 1917. Imports (valued at £20,919,265), however, showed a decrease of 20·6 per cent. compared with 1916, and exports were lower by about 5 per cent. The share of the United Kingdom in competitive imports has gradually declined from 67·1 per cent. in 1914 to 53·3 per cent. in 1917. In the same period, the share of the United States, the leading competing country, has increased from 11·2 to 21·3 per cent., and the share of Japan from 1 to 4 per cent. Australia's share has increased from 4·6 to 9 per cent. and Canada's from 2·6 to 4·7 per cent. While it is very probable that British manufacturers will recover some of the lost trade, "the situation is more disquieting than it has previously been." Although much of this recovery will probably come as a matter of course, "it would be unwise for our manufacturers to imagine that the whole of the trade will revert to them as soon as the war is over." "The chief point to be considered is not how much trade has passed into foreign hands, but to what extent that increased trade is due to organisation of foreign selling campaigns in New Zealand." New Zealand has been extraordinarily prosperous since 1914, and its potential position as a trading country has increased correspondingly; the development of important industries has been rapid and the whole country is anticipating a vast further development after the war.

The subjoined table shows the percentage distribution of imports of a chemical nature; only "competitive" wares are included, *i.e.* those which manufacturers in Great Britain are able to supply.

Class VII.—These imports were mainly glue and size; they show a considerable decline.

Class X.—There were large decreases in the imports of mineral lubricating oil and linseed oil, the two most important items. Imports of the latter from Australia show a considerable increase.

Class XI.—About 84 per cent. of these imports prior to the war were from the United Kingdom, but this figure has been reduced to 63 per cent. In the same period, the share of the United States has increased from 13·6 to about 23·8 per cent. A large proportion of the increased American trade is due to white lead. It is not improbable that a great part of the trade in prepared paints will revert to the United Kingdom after the war.

Class XIIIa.—Imports of pig iron from India continue to increase, and an important trade has developed with Australia in iron and steel, and tin. The most important American line is iron and steel.

Class XXIa.—There was a large decrease in the imports of sodium bicarbonate and caustic soda from Great Britain, and a considerable decrease in toilet and medicinal preparations; the dyes imported showed a slight decrease and were valued at £28,022. The United States shipped a smaller quantity of toilet and medicinal preparations, but rather more dyes (£3096). The Australian trade is chiefly in compressed gases for refrigerating works (an industry which is expanding rapidly) and in medicinal preparations.

Class XXIb.—Imports of manures from the United Kingdom decreased in value from £122,622 in 1914 to £1007 in 1917; 89 tons of basic slag was imported as compared with 36,632 tons in 1914, while the superphosphate imports were reduced by about one-half. The last-named were obtained chiefly from Australia, Japan supplying relatively little. It is intended to expend about £500,000 in the construction of new fertiliser works (mainly superphosphate).

Great attention is being given to hydro-electric developments. The installation at Lake Coleridge has been so successful that the public is pressing the authorities to proceed with the larger scheme of supplying the whole of the North Island with hydro-electric power from three sources eventually to be linked together.

Table of Competitive Imports in 1917.

Class No.	IV	VII	X	XI	XIIIa	XXIa	XXIb
Name	Spirits and Alcoholic Liquors	Unmanufactured Animal Substances other than foodstuffs	Oils, Fats and Waxes	Paints and Varnishes	Metals and Ores	Drugs, Chemicals and Druggists' Wares	Fertilisers
United Kingdom % ..	91	61·5	13·2	63	38	58	0·2
Australia %	1·7	17·7	11·4	10·5	27	19·2	66
Canada %	1·5	—	0·3	2	10	0·5	—
United States %	0·4	9·7	63·0	23·8	8·5	29	0·2
Japan %	—	—	1·1	—	—	1	10
Total values £	505,293	3,747	168,803	180,964	205,745	619,044	186,652

TRADE NOTES.

BRITISH

The Flint and Silica Flour Manufacturers' Association.—At a meeting held at Liverpool on November 21, it was agreed to form an association with the above title, with the object of protecting and furthering the interests of the trade. Those interested are invited to communicate with the Secretary, Mr. F. A. Campbell, Wharton Lodge Works, Winsford, Cheshire.

FOREIGN.

American Dyes in Japan.—American dyes are gaining a hold on the Japanese market, which has hitherto been dominated by German products imported through neutral countries. Of the 482,981 lb. of dyes imported in 1918, 193,342 lb. were of German origin, 13,242 lb. came from Switzerland, and the remainder from other countries, the greater share of this unclassified trade being with America. The new Japanese cotton and silk piece goods industry is regarded as a valuable outlet for the overproduction of American dyes which is bound to follow the war.—(*U.S. Com. Rep., Oct.* 18, 1918.)

The Soap Industry in Denmark.—An important amalgamation of the five largest soap factories has taken place. The new company is to be called the "Danish Soap Industry" and will have a capital of 2½ million Kr. (about £140,000).—(*Z. angew. Chem., Oct.* 18, 1918.)

Manufacture of White Lithopone in Italy.—A Milanese company is manufacturing white lithopone at Brescia. This substance, largely employed in the rubber, enamel, and paint industries, was formerly imported from Germany, although Italy contains the necessary raw material. The process, though complicated, is successful, and some of the product will be available for export. The Italian Government has granted the firm five years' exemption from income tax.—(*U.S. Com. Rep., Oct.* 15, 1918.)

Proposed Saccharin Monopoly in Finland.—A Finnish company has petitioned the Senate to grant it a monopoly of the manufacture and sale of saccharin. The company proposes to get its raw material at first from Germany, and has made arrangements with the Saccharin A.-G. of Magdeburg for the delivery of machinery within two months. It is intended to produce 10,000 kilo. per annum, and to provide for increasing the output to 40,000 kilo. per annum. The price for the first two years is to be F.Mk. 1000 per kilo. (about £18 per lb.) after which a considerable reduction is anticipated. —(*Nya Dagbligt Allehanda, Oct.* 15, 1918.)

New Companies in Sweden.—"The Elektro-Alkali" company has been formed to make bleaching powder and alkali electrolytically according to the latest methods of Siemens and Halske. To start with the capacity of the works will be at least 3000 (short) tons of bleaching powder and 1000 tons of alkali. The capital of the company is to be from 1 million Kr. (minimum) to 3 millions (maximum).

A company with a minimum capital of 1 million Kr. has been formed in Gefle to take over the Chemical Factory Erikson and Rabenius and to manufacture tablets, pastels, etc.

The firms Kramfors and Svano are erecting new sulphite spirit factories in Adelem, and a similar factory is being planned by the "Utansjo" Cellulose Works.

A new cement company has been formed in Stockholm with a capital of 500,000 Kr. to manufacture cement and ferro-concrete.—(*Z. angew. Chem., Oct.* 15, 1918.)

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal* for November 28 and December 5.)

OPENINGS FOR BRITISH TRADE.

A firm at Sao Paulo, Brazil, desires agencies for U.K. manufacturers of paints, varnishes, rubber tubing, etc. [Ref. No. 364.]

A London firm with branches at Batavia, Bandoeng and Medan desires agencies for U.K. manufacturers of chemical food products, patent medicines and glassware. [Ref. No. 368.]

A Russian merchant in Paris wishes to get into touch with U.K. manufacturers of chemicals, dyes, and paper with a view to purchase supplies for sale in Russia when circumstances permit. [Ref. No. 371.]

A firm at Bombay wishes to get into touch with U.K. manufacturers and exporters of chemicals, metals, etc. [Ref. No. 372.]

British manufacturers of celluloid cases for miners' electric lamps now in a position to supply are invited to apply to the Department of Overseas Trade for the name of an inquirer.

Inquiries respecting the following notices should be addressed to The Secretary, British Chamber of Commerce for Italy, 7, Via Carlo Felice, Genoa:—

A firm at Genoa desires to represent manufacturers of chemicals. [1574.]

A Genoa merchant wishes to get into touch with shippers of soap, candles, oils and oil-seeds. [1576.]

A firm at Velletri (Rome) wishes to get into touch with manufacturers and exporters of soap, candles, mineral oils and paper. [1577.]

An agent at Rome wishes to represent manufacturers of chemicals, colours, varnishes, oils and lubricants. [1588.]

TARIFF. CUSTOMS. EXCISE.

Canada.—By a new regulation, importers of all goods which have to pass in transit through the United States *en route* to Canada must apply to the War Trade Board for import licence.

A drawback of 99 per cent. of all the duties paid is now allowed, under certain conditions, on liquid sulphite pulp used for news print paper on and after July 1, 1918.

Denmark.—The export of wax-cloth is prohibited as from November 12.

France.—The decree of June 4 whereby certain classes of soap could be exported without special authorisation when consigned to the U.K., Belgium, Italy and extra-European countries is abrogated as from November 6.

The consumption duty on alcohol in Martinique has been increased from 150 to 175 francs per hectolitre of pure alcohol, as from November 3.

The export of marble, in the rough and sawn, from French colonies other than Tunis and Morocco is prohibited to destinations other than France or the French colonies.

The import of paper-making materials, paper, cardboard and manufactures thereof, into France and Algeria, is subject, as from December 5, to the restrictions imposed on French manufacturers by the Decree of September 5.

Recent Customs decisions affect the consumption duties, in France and Algeria, on alcohol, sugar, coffee and coffee-substitutes.

Italy.—A resolution of the Ministry of Finance dated October 5 classifies petroleum coke for tariff purposes as coal coke.

Kedah.—No export duty on wolfram will be collected for a further period of six months from July 11, 1918.

Spain.—A copy of the regulations which came into force on November 6 for the control of trade in all materials having a narcotic or anæsthetic action may be seen at the Department of Overseas Trade.

REVIEWS.

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. *Edited by* W. A. DAVIS. *Fourth Edition. Vol. IX., Supplement and General Index. Pp.* 836. (*London: J. and A. Churchill.* 1917.) *Price* 22*s. net.*

The method which has been adopted in this volume is to bring up to date the articles in the eight preceding volumes. This has been done, as far as possible, by the contributors to the earlier volumes, but, owing to the circumstances of the time, certain articles have been written by other hands. The earlier volumes appeared in 1907, and, therefore, even making allowance for the inevitable falling off in research due to the war, considerable leeway has had to be made up.

The articles are, for the most part, written in a critical spirit by men who are experts in the particular fields dealt with. In this way it is possible for the researcher and analyst who need methods which can be immediately applied to their work to obtain definite advice as to the value of the different processes described. On the other hand, the articles are in no sense dogmatic, and the views of other workers in the same field are carefully balanced. In some cases, perhaps, one is rather astonished to find that so little work has been done during the eleven years covered by the book. This is notably the case with Rubber, the article on which comprises 3 pages only. There is an admirable article by the Editor on Sugars and Starches occupying some eighty pages. This gives a valuable summary of the progress which has been made in this field during the period under review. Two articles of similar length by E. J. Parry on "Essential Oils," especially the second on "Special Characteristics of Essential Oils," will be of great value to those desiring information on this subject.

Other articles are shorter, varying from 20 pages downwards, according to the progress which has been made in the subject under treatment. When it is mentioned that these include articles on Colouring Matters of Natural Origin by W. M. Gardner, on Aconite Alkaloids by F. H. Carr and on Glucosides by E. F. Armstrong, it will be realised that the Editor has been able to secure the services of some of the most experienced chemists in order to bring his book up-to-date. The volume concludes with authors' and subject indexes to the whole of the preceding volumes.

It is needless to say that not only will it be necessary for all those who use the original volumes to obtain this Supplement but, owing to the manner in which it is compiled, it forms a complete volume in itself, and will therefore be a valuable addition to the chemist's library even though the individual concerned may not wish to possess the earlier work.

J. F. THORPE.

THE CHEMICAL ENGINEERING CATALOGUE.—The third edition of this well-known reference book is now to hand. Like the previous editions it gives in a concise form much information that is indispensable to chemical manufacturers, but various improvements have been introduced, *e.g.* a useful list of technical publications has been added, and the number of manufacturing firms included is now 439, as against 247 in the 1917 and 132 in the 1916 edition. The second edition was reviewed in our issue of January 15, 1918 (23 R).

COLOUR IN RELATION TO CHEMICAL CONSTITUTION. *By* E. R. WATSON. *Monographs on Industrial Chemistry, edited by* SIR ED. THORPE. *Pp. xii + 197, with 4 coloured plates and 65 figures.* (*London: Longmans, Green and Co.* 1918.) *Price* 12*s.* 6*d. net.*

The author of this volume gives an admirable account of the subject, although no attempt has been made to refer to all the researches. Fortunately, the Reports of the British Association can always be consulted for a more complete bibliography. The chief experimental methods used in the study of absorption spectra are described, and an advantage is claimed for the spectrophotometer because of its alleged power to determine the edges of absorption bands. This may be true for broad solution bands, but for narrow vapour bands the advantage is with the ordinary spectroscope. The absorption curves of some typical organic substances and dyes are well reproduced: but, again, the more complete records should be studied in the original papers. Saturated fatty compounds show no bands, and it is generally considered that unsaturation is the cause of selective absorption. This belief will undoubtedly require modification, for there has been no systematic exploration of the infra-red absorption of such substances: nor, indeed, of very few substances, saturated or unsaturated, of the extreme ultra-violet or Schumann region.

The early suggestions of Witt and Armstrong and Nietzki are deservedly praised. They are still the well-tried rules of the colour chemist. Few interpretations have been so fruitful of important investigations as the quinonoid theory; but it must be rejected as an exhaustive explanation. The later theories on the nature of the vibrations which produce selective absorption will probably be considered with critical sympathy, or otherwise, according to the strength of the affection for this or that development. It is a little difficult at times to keep in touch with the various modifications; for the ground is covered with dead and dying hypotheses. The problem to be solved is infinitely complex even with simple substances, and much more experimental work is required before there can be a satisfactory explanation. For instance, it will be necessary to employ a spectroscope of greater dispersive power than has hitherto been used. This will help to separate overlapping bands which now appear as a single band, and to prove that solution bands really consist of a number of narrow bands which are not unlike the vapour bands. In this direction it will probably clear up a series of facts described some years ago that, of the vapour bands of various benzene derivatives, the large more refrangible band is not resolved into a series of fine bands like that of the less refrangible one. It is like the corresponding broad solution band in appearance. Again, it is safe to say that bands will either be widened or subdivided under the influence of a strong magnetic field exactly similar to the absorption bands of didymium and erbium and the bright line spectra. That means the use of instruments of large dispersion and powerful electro-magnets. Furthermore, the infra-red regions have been scarcely touched, and the pioneer work of Coblentz strengthens the claim for more extensive explorations. Research is needed in all these directions before the laws of colour can be definitely issued: and, perhaps, some day, when the material has been collected, Dr. Watson, in a later edition of his useful book, will be able to give us a more exact answer to this fascinating problem. It should then include an explanation of the colour of elements like the halogens as well as of the complex dyes.

J. E. PURVIS.

PUBLICATIONS RECEIVED.

Report on the Progress and Condition of the United States National Museum for the Year Ending June 30, 1917. *Submitted by* R. Rathbun *and* Dr. C. D. Walcott. *Pp.* 184. (*Washington: Government Printing Office.*)

An Introduction to Trade Unionism. *By* G. D. H. Cole. *Trade Union Series. No.* 4. *Pp.* 128. (*London: Fabian Research Department*, 25, *Tothill Street, Westminster; G. Allen and Unwin, Ltd.*, 40, *Museum Street, W.C.* 1918.) *Price* 5s.

The Payment of Wages. A Study in Payment by Results under the Wage-System. *By* G. D. H. Cole. *Trade Union Series. No.* 5. *Pp.* 155. (*London: Fabian Research Department*, 25, *Tothill Street, Westminster; G. Allen and Unwin, Ltd.*, 40, *Museum Street, W.C.* 1918.) *Price* 6s.

Platinum, with Special Reference to Latin America. *By* G. F. Kunz. *Reprinted from the November*, 1917, *Issue of the Bulletin of the Pan American Union.* (*Washington: Government Printing Office.*)

Steel Structures. Quarterly Journal of the Steel Structural Section of the British Engineers' Association. *Vol. I. Parts I. and II. Price* 6d. *per part.* (*London:* 32, *Victoria Street, S.W.* 1.)

Modern Chemistry and Chemical Industry of Starch and Cellulose. (With Reference to India.) *By* T. C. Chaudhuri, M.A. *Pp.* 156. (*Calcutta: Butterworth and Co.* (*India*), *Ltd.* 1918.) *Price* 5s. *net.*

Tables of Refractive Indices. Vol. I., Essential Oils. *Compiled by* R. Kanthack. *Edited by* J. N. Goldsmith. *Pp.* 148. (*London: A. Hilger, Ltd.* 1918.) *Price* 15s. *net.*

Publications of the United States Bureau of Mines. Department of the Interior. (*Washington: Government Printing Office.* 1918.)

- The Diesel Engine, its Fuels and its Uses. *By* H. Haas. *Bulletin* 156. *Petroleum Technology No.* 44. *Pp.* 133. *Price* 25 *cents.*
- Suggestions for Improved Methods of Mining Coal on Indian Lands in Oklahoma. *By* J. J. Rutledge *and* D. Harrington. *Technical Paper* 154. *Pp.* 36. *Price* 10 *cents.*
- Chart of Properties of Mine Gases. *Compiled by* G. A. Burrell.
- Monthly Statement of Coal-Mine Fatalities in the United States, June, 1918. List of Permissible Explosives, Lamps, and Motors Tested prior to July 31, 1918. *By* A. H. Fay. *Price* 5 *cents.*
- Production of Explosives in the United States during the Calendar Year 1917. With Notes on Coal-Mine Accidents due to Explosives and List of Permissible Explosives Tested prior to April 30, 1918. *By* A. H. Fay. *Technical Paper* 192. *Price* 5 *cents.*
- Coke-Oven Accidents in the United States during the Calendar Year 1917. *By* A. H. Fay. *Technical Paper* 206.
- Saving Coal in Boiler Plants. *By* H. Kreisinger. *Technical Paper* 205. *Pp.* 24. *Price* 5 *cents.*
- Efficiency in the Use of Oil Fuel. A Handbook for Boiler-Plant and Locomotive Engineers. *By* J. M. Wadsworth. *Pp.* 86. *Price* 15 *cents.*
- Gold Dredging in the United States. *By* C. Janin. *Bulletin* 127. *Pp.* 226. *Price* 50 *cents.*

Publications of the United States Geological Survey. Department of the Interior. (*Washington: Government Printing Office.* 1918.)

- Tin in 1917. *By* A. Knopf.
- Fuller's Earth in 1917. *By* J. Middleton.
- Silver, Copper, Lead, and Zinc in the Central States in 1917. Mines Report. *By* J. P. Dunlop *and* B. S. Butler.
- Barytes and Barium Products in 1917. *By* J. M. Hill.

OBITUARY.

W. MAIN.

William Main, chemist, engineer, and inventor, died on October 18 last at Piermont, New York, U.S.A. He was a graduate of both the University and the Polytechnic College of Pennsylvania, and professor of chemistry in the University of South Carolina from 1873 to 1877.

In 1866, he established, at Central City, the first assay office in the State of Colorado, and for many years was active in mining and metallurgy in the Rocky Mountain States, the Lake Superior copper regions, and the lead fields of Missouri. His work on the copper blast furnace and treatment of copper sulphide ores, and on rocking tables and machinery for the concentration of lead ores, was of a pioneer nature, and many of the devices and processes which he invented and introduced 40 to 45 years ago are still in use. He also invented and developed the lead-zinc storage battery and was probably the first to apply commercially the storage battery to the electrical propulsion of street cars and boats.

Since 1879 Prof. Main practised as a consulting chemist and engineer, and he did much work in connexion with water purification, septic tanks, photographic films, electric lamp filaments, production of ozone, and the hydrogenation of oils.

F. N. Waterman.

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor*.

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably typewritten) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Induchem, Finsquare, London.*]

CHEMICAL ENGINEERING GROUP.

The attention of members of the Society of Chemical Industry is drawn to the newly formed Chemical Engineering Group of the Society, and to the Application Form for Membership of the Group which is inserted in this issue of the Journal.

The formation of a Chemical Engineering Group was proposed by Prof. J. W. Hinchley, of the Imperial College of Science and Technology, London, who, after communication with the Council of the Society, called a meeting, held in London on July 29 last, at which it was resolved to form the Group, a Provisional Committee and Hon. Secretary being appointed (this J., 1918, 296 R). A memorandum, explaining the objects of the Group, drawn up by this Committee, was sent to every home member of the Society, with a postcard on which the member was asked to state whether he was in favour of the formation of such a Group and whether he would join it, if formed. About 800 members, forming 90 per cent. of those who replied, in returning the postcard, promised membership of the Group. By invitation of the Committees of the Liverpool, Glasgow and Bristol Sections, a meeting was held in each of those cities, and resolutions supporting the formation of the Group were passed unanimously (this J., 1918, 413 R).

A Sub-Committee appointed by the Council met the Provisional Committee of the Group on October 4 last, and, after discussion, decided to recommend the Council to accept the principle of the establishment of Subject Groups, of which the Chemical Engineering Group would be the first, and this recommendation was adopted by the Council at its meeting on October 24 last (this J., 1918, 391 R). Rules for the Group, drawn up by its Provisional Committee, have been amended and approved by the Sub-Committee of the Council in collaboration with representatives of the Group Committee, and the amendments of the by-laws of the Society which the establishment of Subject Groups entails have been drafted, and will be submitted in due course to the Society for approval.

The rules of the Chemical Engineering Group provide for the conduct of its business by a Committee with honorary officers. Each Local Section of the Society may nominate an honorary correspondent to the Group. The ordinary meetings of the Group are to include conferences, announced long in advance, on special chemical engineering topics of industrial importance in the locality chosen for the meeting, but Local Sections will be consulted before a Group meeting is arranged within their district. Advance copies of papers are to be circulated, but the Society retains the right of priority in the publication of papers and discussions thereon. In cases where this right is not exercised, the Group itself may publish the papers, etc., and intends also to issue an annual volume of proceedings, and useful data from time to time. The special expenses of the Group will be met by an annual subscription, the amount of which for the ensuing year will be one guinea. Joint conferences with other technical bodies are contemplated, as well as vigorous development of chemical engineering education and research. The establishment of a research fund administered through the Group is also contemplated, and a library of technical catalogues, with an inquiry bureau in connexion therewith, is being arranged. A technological library will also be established either independently or by co-operation. Attention will be given to preparing specifications of materials and standardising fittings, etc.

The foregoing *résumé* of some of the projected activities of the Chemical Engineering Group will serve to suggest to all members of the Society who are interested that they should forthwith apply for membership of the new Group.

Further details will be furnished on application to the Honorary Secretary, Chemical Engineering Group, 15, New Bridge Street, London, E.C. 4, to whom completed membership application forms and subscriptions should be sent as soon as possible.

THE SCOTTISH MINERAL OIL INDUSTRY.

The Scottish oil industry, as the only actual producer of mineral oil in this country, has come into renewed prominence since the outbreak of war. The industry came into existence about the middle of last century, being founded by the late Mr. James Young, LL.D. The raw material originally used was not shale, but was more of the nature of cannel coal, and known as the Boghead or Torbanehill mineral. This mineral, which gave a very high yield of oil, became exhausted in the course of about a dozen years, and the oil shales of Mid and West Lothian came into use, and have remained the basis of the industry ever since. The shales give a much lower yield of oil than the Torbanehill mineral, but this is largely compensated for by the high yield of ammonia.

About the time that the working of the shales was started the production of petroleum in America began to assume important proportions. A few years afterwards the production of oil in Russia also commenced to increase rapidly, and before long the Scottish industry began to feel the force of competition from petroleum. At times this competition has been so fierce that the home industry has been on the verge of complete extinction, this country having been used as a free dumping-ground for petroleum products. The extent to which the Scotch industry is handicapped will be understood when it is remembered that mines have to be sunk at great cost for the purpose of winning the shale, which, after being brought to the surface, is subjected to destructive distillation, for which expensive retorting and other plant have to be provided. These costly operations have to be undertaken before the stage is reached at which the crude oil is produced, which corresponds to the crude product obtained from the petroleum wells at comparatively insignificant cost. After that stage the elaborate processes of refining have to be carried out.

The Scotch industry has the advantage of the by-product, sulphate of ammonia, which is a very valuable source of revenue, but in spite of this it has only been by continual discovery and adoption of improvements in plant and methods of working that at certain periods in its history the industry has been kept alive. As indicating the vicissitudes passed through, it may be mentioned that whereas about the year 1870 there were over fifty companies engaged in the industry, there are now only six.

In the early days of the war the production fell away owing mainly to scarcity of labour; but as outside supplies of oils were gradually cut off the Government came to realise the importance of the home production, and a committee was formed consisting of representatives of the companies, of the workmen, and of the Government, for the sole purpose of obtaining a maximum output. The results have been gratifying, as although the works are not producing quite to their utmost capacity, production has been well maintained, and there

can be no doubt that but for the support of the Production Committee in regard to supplies of labour and the necessary materials for the maintenance of the mines and works, there would have been a very serious shortage in output.

The principal products of the industry are motor spirit, naphtha, burning oil, fuel oil, gas oil, lubricating oil, paraffin wax, and sulphate of ammonia.

In regard to values, the prices of the liquid products and of wax are regulated by the prices of imported oils and wax, and as the prices of the latter are abnormally high owing in a great measure to the heavy freight charges and cost of insurance, prices of the Scotch oils and wax are also at a high level. The price of sulphate of ammonia is controlled by the Government and is not excessive.

As regards post-war prospects, it is more difficult to speak. The position of the industry is peculiar in that it has no control either over the prices of its products or over the principal items in the cost of production. As regards the former, the prices of oil products are, as has been indicated, regulated by the prices fixed by foreign companies, and this cannot well be otherwise, for the total quantity of oil produced by the Scottish companies before the war was only about 10 per cent. of the total imports into this country. The price of sulphate of ammonia, which is the source of a large proportion of the total revenue of the oil companies, and of which the aggregate annual output before the war was about 60,000 tons, is ruled to a large extent in ordinary times by the price of nitrate of soda.

In regard to costs of production, the chief item is wages, over which the oil companies have no control, the reason being that the greater number of their workmen is employed at the shale mines, where the work is similar to that at the coal mines, and the wages are entirely ruled by the wages paid in the coal trade. The next largest item in the cost of production is coal, of which the industry is a very large consumer. When wages in the coal industry are high, the price of coal must of necessity also be high, and both tell heavily on the companies.

In the past the companies have suffered more from low prices of products than from unduly high cost of production, but in the future the position may to some extent be modified. It is generally thought that wages in the coal trade and the price of coal are not at all likely to go back to the pre-war standard, consequently costs in the oil industry will probably be on a higher level in the future than before the war. If this should be so, it would appear that if the prices of the products were to go back to the low level ruling previous to the war, the oil companies may again experience difficult times. There are grounds, however, for hoping that the prices for products will also be on a somewhat higher level in the future.

No doubt petroleum products will be plentiful after the war. A depletion of stocks has taken place in America, due to the abnormal demands in connexion with the war, and on account of this and of an ever-growing home demand, the exports from America may not be so large as formerly. Immense supplies of oil, however, are available in other great oil fields, notably in Mexico, and it may be that only a shortage of tonnage for a time will prevent overabundant quantities being exported to this country and to the other markets of the world. On the other hand, the demand for all oil products should be very great in the future, particularly for motor spirit and fuel oils. The use of petrol was growing very rapidly before the war, and it is certain that the demand will continue to expand, and the problem may be how to obtain sufficient supplies to meet the demand. The probability is that the oils of higher boiling point will be brought into use more and more for power purposes. In this connexion it may be stated that within the last two or three years oil of the illuminating grade has been in demand as a power oil for motor fishing boats and farm motor tractors. There is every likelihood of great developments in the future in these directions.

It would appear, therefore, as if the demand for petrol and oils for power purposes must tend greatly to prevent prices of oil products falling to an unprofitable level.

What the price of sulphate of ammonia may be later on is somewhat uncertain. The great bulk of the sulphate of ammonia produced in this country before the war was exported. Germany also exported it, the production there being more than sufficient to meet home requirements. It is understood that owing to the stoppage of supplies of nitrate of soda to Germany during the war, an enormous increase in the production of sulphate of ammonia has taken place there, and should this increased production continue after the war, it will mean that the quantity for export from Germany will be much greater than formerly, and this may tend to lower the value of the material. A hopeful feature, so far as the makers in this country are concerned, is that as the farmers here have now had practical experience of using sulphate of ammonia, and as the results have been entirely satisfactory, they may continue to use it on a large scale, and thus make it unnecessary to look to foreign markets for outlets.

Taking all the circumstances into account, it would appear as if the Scottish mineral oil industry may regard the future with some degree of confidence.

It is interesting to note that recently a Selling Agency has been formed for the sale and distribution of the products of Scotch oil companies. For the present the agency will deal only with motor spirit, naphtha, and burning oil, but it is intended that it will eventually take over all the products. Besides tending to increased economy and efficiency, by eliminating competition amongst the various companies and preventing overlapping in the distribution of products, the formation of this agency should put the industry in a stronger position to meet outside competition. It may be that this step may lead later on to a still closer union of interests. The question of amalgamation is one that has been raised from time to time at the annual meetings of the companies.

As regards mineral resources, the future of the industry appears to be well assured, for the supplies of shale still available in the Lothians and district are estimated to be sufficient to maintain the present rate of production for some generations.

THE APPLICATION OF SCIENCE TO CACAO PRODUCTION.

A. W. KNAPP.

There is a great field for the application of physical and chemical knowledge to the production of the raw materials of the tropics In one or two instances notable advances have been made, thus the direct production of a white sugar (as now practised at Java) at the tropical factory will have far-reaching effects, but with many tropical products the methods practised are as ancient as they are haphazard. Like all methods founded on long experience they suit the environment and the temperament of the people who use them, so that the work of the scientist in introducing improvements requires intimate knowledge of the conditions if his suggestions are to be adopted. The various

Departments of Agriculture are doing splendid pioneer work, but the full harvest of their sowing will not be reaped until the number of tropically-educated agriculturists has been increased by the founding of three or four agricultural colleges and research laboratories in equatorial regions.

(*a*) *World production.*—To illustrate the above generalisation I propose to take the production of cacao (the seed or bean from which cocoa is prepared). At the present time the average yield per tree is surprisingly small, being about 1½ to 2 lb. a year, and the total world production is about 290,000 tons a year. By scientific agriculture, taking a conservative estimate, the average yield per tree could be raised to 6 lb. and the total production to over a million tons a year.

(*b*) *Harvesting the crop.*—The cacao tree is about the size of an apple tree and the pods grow on its trunk and stems. The tree will not bear climbing, and the pods are cut from the tree by knives on the ends of poles: a difficult operation. Considerable ingenuity has been exercised to produce a gatherer which will sever the pod-stems and yet be "fool-proof," but the ideal method of collecting has yet to be found.

(*c*) *Extracting the beans.*—The pods have to be cut and the juicy beans removed. This is generally done with a cutlass. What is needed is a knife which will cut the husk of the pod without injuring the beans within. The placenta (the part of a plant to which the seeds are attached) contains a fair percentage of pectin, of which no use is made.

(*d*) *Conveying cacao to the fermentation house.*—Mechanical transport is very rare indeed, only in one or two places is use made of trucks running on Decauville rails. It is, however, in use in San Thomé, where a single estate will produce 2000 tons a year.

(*e*) *Fermenting.*—The seeds or beans are covered with a juicy pulp and would rot if they were not dried. The best way to remove the pulp is to allow it to ferment; this occurs naturally on exposure to air, as with grape-juice. The effects of fermentation are various and, with good fortune, all advantageous—the bean becomes more easy to dry, and on drying becomes crisp; it develops a richer colour, and on roasting, a finer aroma and flavour. Fermented cacao always fetches a higher price than unfermented cacao from the same place, but fermentation is by no means universally practised. Hence one finds on the market considerable quantities of cacao which contain mouldy beans, for unfermented cacao readily goes mouldy; this is a serious loss to the world. Fermentation is not carried on anywhere in a scientific manner, everywhere the cacao is at the mercy of the chance organisms in the air. The quality of the cacao produced varies, and the quality is reflected in the prices obtained; thus the Food Controller has fixed the price of British West African cacao at 65*s.* a cwt., Grenada at 85*s.* a cwt., and Ceylon at 100*s.* a cwt. The quality of any cacao is the result of the botanic variety or "breed," plus the treatment it receives in preparation for the market. Now Grenada and Ceylon cacaos are obviously different in "breed," so that Grenada cannot hope by fermentation, however scientific, to get the Ceylon bean. The line of improvement for Grenada is to try the planting and rearing of the more delicate Ceylon type of cacao. With the cacao from Grenada and British West Africa the case is otherwise. The British West African bean is of a very similar type to that grown in Grenada and is slightly superior because it is larger and contains less shell (about 12 per cent. as against 15 per cent.). Grenada beans are very carefully prepared (if not scientifically yet with great art) and give practically 100 per cent. perfect beans. This is the explanation of the higher price given for Grenada cacao, although at the present time this difference is magnified by exceptional conditions.

No entirely satisfactory theory of the changes in cacao due to fermentation has yet been established. It is known that the sugary pulp outside the beans ferments in a similar way to other fruit pulp, save that for yeast fermentation the temperature rises unusually high (in three days to 47° C.): and also that there are parallel and more important changes in the interior of the bean. Fickendey, Loew, Nicholls, Preyer, Schulte im Hofe, and Sack, have made useful contributions to the subject, and recently Brill has determined the actual ferments present. He finds casease, protease, oxidase, raffinase, invertase, diastase, and an emulsin. But there is still a vast amount of work to be done before the chemist will be in a position to obtain the more desirable aromas and flavours. Having found the necessary conditions scientifically trained overseers will be required to carry them out, and for this they will need to have under their direction arrangements for fermentation designed on correct principles and allowing some degree of control. Possibly also enterprising firms will build competing types of plant, in portable sections, easily erected. In these, mechanical mixing will replace the present laborious method of turning the beans by hand. They will doubtless be fitted with suitable devices for catching the liquid which flows away from the beans during fermentation. In choosing a suitable material the makers will have to remember that the beans and pulp contain tannic and acetic acids. As the present overseers generally have no knowledge of chemistry, they do not understand how the appearance of the cacao may be spoiled by the iron nails used in constructing the fermentation boxes. One sometimes sees corrugated iron roofing corroded by acetic acid vapour, or a cement floor eaten into by the acid juice. This leads to the question of the use of the juice which runs away from the beans during conveyance and during fermentation. At present all this runs to waste, and it cannot be less than eight million gallons a year. This juice or "sweatings" contains about 15 per cent. of solids, about half of which consists of sugars. If the fermentation of the cacao were centralised in the various districts, and conducted on a large scale under a chemist's control, the sugars could be obtained, or an alcoholic liquid or a vinegar could easily be prepared. This acid liquid might also be used for the coagulation of rubber latex. Sir George Watt, in 1913, patented a portable machine for extracting the beans. It cuts off the base of the pod, squeezes out the beans, and includes an arrangement for collecting and preserving the juice which is produced by this operation. This machine has apparently never been used. Machines which are used for drying the beans have, however, met with a better fate.

(*f*) *Drying.*—This is the only point in cacao production which has received much attention from the engineer. Whether the cacao has been fermented or not, it has to be dried to prevent it going mouldy. The common practice is to spread it on platforms or mats and dry in the sun. In a few places, where sun-drying is difficult, drying machines are slowly coming into vogue. Many engineering firms make drying plant of one sort or another, drying by hot air, *in vacuo*, etc., and doubtless the general principles of drying are well understood, but to make a really satisfactory drying machine one must have knowledge of the chemical and physical nature of the raw product. Too often the makers conclude that a machine which will dry one product is suitable for all others. The great opportunities of the future should encourage further research, for now that transport is so costly the value of drying *all* tropical pro-

ducts is enhanced. In the drying of cacao, apart from loss of acetic acid, more than mere loss of moisture occurs. It has been pointed out by several observers, notably by Schulte im Hofe, that during sun-drying the changes due to fermentation continue, particularly the change due to an oxidase, *i.e.* the oxidation of a tannin, which results in the removal of the astringent taste and the development of a brown colour. With drying machines the conditions are often unfavourable to this action. This is one of the reasons why at present manufacturers of cocoa slightly prefer sun-dried cacao.

Criticism could be made of the various subsidiary processes (washing, claying, polishing, etc.) to which the beans are subjected in different countries, but sufficient has been said to give an idea of the wide field for research and of the opportunities for the application of known facts.

NEWS FROM THE SECTIONS.

CANADA.

"The Canadian War Mission at Washington and Canadian Industry" was the subject of an address by Prof. J. Watson Bain to the Canadian Section at Toronto on November 21. The author, who gave up his work at Toronto University to act as technical adviser to the War Mission at Washington, stated that the functions of the War Trade Board in that city were to obtain raw materials for Canadian manufacturers, and to place contracts for raw and finished products coming from Canada. He then dealt with some of the problems arising out of the cessation of war activities, such as the utilisation of sulphuric acid plants for manufacturing acid phosphates, the fixation of atmospheric nitrogen, and the electrico-chemical industries. Prof. Bain also related facts indicating the tremendous scale upon which the Americans had been prepared to manufacture chlorine and other poison gases for use against Germany.

A motion was passed at the meeting that a memorandum be drawn up for presentation to the Dominion Government urging the maintenance in Canada of such key industries as the manufacture of sulphuric acid, glycerin, nitrates and nitrocellulose.

MANCHESTER

On December 6, at Manchester, Mr. S. J. Tungay read a paper on "Chemical Plant Construction in Acid-Resisting Iron."

It is probable that only during the war has the great importance of the use of acid-resisting iron in chemical plant been fully appreciated in Great Britain. It would be difficult now to overstate its value, even though its use has involved wide variations in chemical plant designs. In describing "ironac," the author pointed out that it shrinks considerably in cooling and is difficult to manipulate in the manufacture of vessels and castings, although great progress in overcoming the difficulties had been and was being made, particularly in regard to plant for the heavy chemical industry. In connexion with the manufacture of sulphuric acid, "ironac" had been employed in the making of various parts of chamber plant, such as pipes and bends to convey hot gases to towers and chambers, nitre pots, tower distributors, atomisers and circulating pumps for sulphuric and nitrosulphonic acids. It was also being used in catalytic plants, in the concentration and recovery of residual sulphuric acid, and for a large variety of apparatus to contain sulphuric and nitric acids, such as retorts, pans, vessels, jacketed pans, autoclaves, sulphonating and nitrating apparatus, etc. The metal not being malleable or ductile, could only be produced in the form of castings, and if of correct acid-resisting quality could not be turned, drilled or screw-threaded, being only machinable by grinding at high speeds with abrasive materials. Owing to the very considerable shrinkage of castings on cooling flat surfaces had to be avoided. Pipes must be fitted with flange- or socket-connexions. Covers of vessels required to be domed and the bottoms dished, and pipes and other similar castings should be so arranged that the cores were supported without chaplets. The cores themselves must be as stiff as possible and particularly well supported in the prints to ensure clean and good castings. Flanges of pipes and vessels could be webbed or filleted to the main body or surface of the casting, and bolt slots cored in flanges in preference to bolt holes, which could not be drilled. Satisfactory flanged connexions had been made by casting lengths of pipe with conical buttressed flanges instead of flat flanges in a way similar to that adopted for earthenware pipe connexions, cast iron clips in halves being utilised to clamp the joints together. (See also this J., 1918, 93 R, 87 T.)

EDINBURGH.

The meeting on December 10, presided over by Mr. D. B. Dott, was devoted to a general discussion on "Evaporation and Distillation." Dr. H. E. Watt opened on the subject of evaporation, and Mr. J. G. Annan followed with a sketch of the development of the process of distillation from the earliest times until the present day. The methods of distillation used in the coal tar, petroleum and shale oil industries were reviewed, and the reasons for the different methods applied were indicated.

NOTTINGHAM.

The fourth meeting of the session was held at University College on December 11 under the presidency of Mr. F. H. Carr. Prof. H. R. Procter read a paper on "The Nature of Liquid Surfaces." The author gave an exposition of the physics of surface tension phenomena, applying the theory to the relation between liquids and compressed vapours up to the critical state, to the relation between solids and liquids, and to that between immiscible liquids. He also dealt with the phenomena of adsorption from the same point of view, and with the properties of emulsions.

Messrs. H. Droop Richmond and C. A. Hill then gave an account of their work on "The Analysis of Commercial Saccharin," Part II. In a former paper (this J., 1918, 246 T) the authors described the estimation of saccharin by hydrolysis, followed by estimation of the resulting ammonia; in the present paper an account was given of the detection and estimation of the impurities, *viz.*, moisture, mineral matter, parasulphonamidobenzoic acid and orthotoluenesulphonamide. The estimation of moisture presents some difficulty because water hydrolyses saccharin; mineral matter is estimated by subliming saccharin just above its melting point, or by dissolving it in acetone so that the mineral matter is left behind; parasulphonamidobenzoic acid, the most important impurity, is determined by finding the differences of titration value between this acid and saccharin, or by taking advantage of its insolubility in water; whilst orthotoluenesulphonamide is estimated by taking advantage of its insolubility in sodium hydrogen carbonate solution, in which saccharin dissolves.

The ensuing discussion elicited the fact that saccharin had been manufactured locally for some time past.

BIRMINGHAM.

The discussion on "The Chemistry of the Colloid State" was resumed on December 12 at the Uni-

versity, Mr. L. P. Wilson contributing a paper on "The Artificial Silk Industry," and Dr. D. F. Twiss one on "Rubber as a Colloid."

Cellulose, the basis of all commercial processes for the production of artificial silk, is in its properties and reactions a colloid, and is far more complex in its behaviour than most other carbohydrates, or even than the colloids of animal origin such as albumen or gelatin. It was insoluble in all simple solvents, unless its molecular constitution was altered either by breakdown or by the introduction of new radicles; it had amphoteric properties, combining with acids and alkalis to form definite compounds, *viz.*, salts and alkali-cellulose. Most of its so-called "solutions," or those of its compounds, were liquids of high viscosity, and many of them were easily gelatinised. These properties, together with the fact that there were many forms of cellulose indistinguishable by chemical analysis, but differing as colloids in their behaviour, made the manufacture of artificial silk and the investigations connected therewith a series of adventures, and caused the chemists engaged in the industry to be prepared to disbelieve any chemical theory whatsoever. Probably the solvent in which cellulose dissolved with least alteration was cuprammonium sulphate, which would take up about one-twelfth of its weight to form a thick liquid. This solution had been largely used in the manufacture of artificial fibres both in England and on the continent.

Dr. D. F. Twiss dealt with the nature of rubber latex and raw rubber, with special reference to the adsorptive and solvent powers of the latter. The behaviour of rubber latex in many respects resembles that of a simple inorganic negative colloidal suspension, and similar methods of coagulation or precipitation are applicable to both. In the case of the coagulation of latex with a very small proportion of acid, or spontaneously, the process appears to be dependent on the presence of an enzyme, and to be in this respect analogous to the clotting of milk by rennet.

Raw rubber is a colloid of the emulsoid type, and gives solutions of various degrees of dispersity in different solvents. Like most colloids under suitable conditions, it exerts a marked adsorptive action and solvent effect. These characteristics have an important influence on the composition of raw rubber, and on the behaviour of rubber during and after vulcanisation. The artificial synthesis of rubber is rendered more difficult by the colloidal nature of the desired product.

MEETINGS OF OTHER SOCIETIES.

THE CHEMICAL SOCIETY.

At an ordinary meeting held on December 5, the President, Prof. W. J. Pope, presiding, a paper by Dr. R. V. Wheeler, entitled "The Inflammation of Mixtures of Ethane and Air in a Closed Vessel: The Effects of Turbulence," was communicated by Prof. W. A. Bone in the absence of the author.

Following up the early work of Schloesing and de Mondesir, the effect of turbulence on the spread of flame through combustible mixtures was investigated. A 4-litre bomb, as described in an earlier paper (Chem. Soc. Trans., 1918, 113, 840) was employed. Information as to the character of the agitation produced by a fan, and the appearance of the flames, was obtained from a series of experiments with weak gaseous mixtures in a glass sphere. It was observed that a pointed tongue of flame spreading from the source of ignition (at the centre of the vessel) was drawn downwards towards the axis of the fan and spread thence with a swirling motion in an oblique spiral completely throughout the mixture. The use of the fan, although it helped the propagation of flame, increased the difficulty of ignition of the mixture; this was most noticeable with the fan running at a high speed and with mixtures at the lower limit of inflammability.

The effect of agitation on all ethane-air mixtures was to increase the rate of spread of flame. It was anticipated that the difference in speed of flame in turbulent as compared with quiescent mixtures would be dependent on the degree of turbulence imparted to the mixture, and be most marked with the slower-burning mixtures. Both deductions were verified experimentally. In each instance the rounded upper portion of the pressure curve for a quiescent mixture was raised to a sharp cusp when the mixture was turbulent. The value for the maximum pressures attained, as recorded by such a cusp, agreed with the "corrected" value for a quiescent mixture of the same ethane-content, the correction applied being based on the assumption that the characteristic flat portion at the crest of the pressure-curves of quiescent mixtures represents a balance between heat dissipated and heat evolved, after combustion is complete, through the equalisation of temperature gradients in the burnt gases. The conclusion reached by Pier in his work on the specific heats of gases, that no correction of the pressures produced is necessary with respect to the attainment of temperature equilibrium, was held to be fallacious.

Dr. G. Barger gave a short summary of a paper by himself and Mr. W. W. Starling on "Blue Adsorption Compounds of Iodine. Pt. IV. Phenanthracoumarins." Of a number of new compounds isolated, only one, a pyrone derivative, was more sensitive to iodine than starch.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At a meeting of the Institution held on December 17, a paper on "The Production of Oil from Mineral Sources" was read by Dr. F. Mollwo Perkin. The author dealt with the production of oil from coal, shales and cannel, etc., and discussed the properties of the products obtained under different conditions of working. The main distinctions between the products obtained by high and low temperature distillation of bituminous coal are as follows:—

High Temperature. a. Large volume of gas, say 12,000 cu. ft. per ton on the average. b. Average yield of ammonium sulphate, 20 lb. per ton. c. Average yield of tar, 11 galls. per ton. d. The tar is composed largely of aromatic hydrocarbons (benzene, toluene, naphthalene, anthracene, also carbolic acid and cresols), which are the raw products for the manufacture of dyes, explosives, photographic chemicals, drugs, etc.

Low Temperature. a. Low volume of gas, say 5000 cu. ft. per ton on the average. b. Average yield of ammonium sulphate 10—11 lb. per ton. c. Average yield of tar (crude oil) 20 galls. per ton. d. Tar (crude oil) consists of hydrocarbons of the aliphatic series (paraffins, olefines and naphthenes). From the tar can be obtained motor spirits, fuel oil, lubricating oil and paraffin wax. The tar acids are useful for disinfectants, but are of no use as raw products for other industrial purposes.

In determining therefore whether, in a given case, high or low temperature carbonisation should be used, the nature of the required products must first of all be considered.

The first products of the distillation of bituminous materials are of paraffinoid nature; in

the low temperature retorts at say 450°—500° C. these products are not subjected to further decomposition, whereas in the horizontal retorts at say 1100° C. and the vertical retorts at 1300°—1400° C. these primary products are subjected to further decomposition on reaching the hot walls of the retorts, giving rise to benzenoid compounds.

With low temperature distillation there are the following possibilities:—1. The production of oil and smokeless fuel. 2. The production of oil and the conversion of the fuel residue into power-gas by gasifying it in a producer. 3. The production of oil, using a portion of the fuel for domestic purposes and gasifying the remainder. The smokeless fuel produced by low temperature distillation contains from 7—11 per cent. of volatile matter and may be used in an open grate burning without flame or smoke, whereas the coke produced by high temperature working contains practically no volatile matter and is not suitable for use in open grates.

The following examples were given as typical of the values of these products for gas production:—

1. A coke produced on low temperature plant—the plant of the Tarless Fuel Syndicate—was found to contain:—Volatile matter 9·87%, fixed carbon 7·54%, yield of gas per ton gasified 128,000 cu. ft., B.T.U. of gas 139, sulphate of ammonia 101 lb.

2. A coke produced in the Glover-West retorts, when the temperature of the flues was about 1400° C., contained:—Volatile matter 1·31%, fixed carbon 86·9%, yield of gas per ton gasified 175,000 cu. ft., B.T.U. of gas 132, sulphate of ammonia 23 lb.

The author then dealt with the available sources of supply of fuel or crude oil, *viz.*, the Kimmeridge shales of Norfolk and Dorset, brown coal and lignites of Bovey Tracey, and peats. A corporation with strong financial backing had recently been formed, which was prepared to expend £100,000 on thoroughly examining the suitability of various retorts for low temperature carbonisation in order to determine whether any such were fully satisfactory, and if not, to proceed from the knowledge thus obtained to the development of a type which would give the required results.

Prof. J. S. Brame and Dr. Dunstan pointed out that the varying nature of coals had in the past given rise to discrepancies in the results of various workers, and also stated that further research was required as to the properties of the tar acid oils from low temperature carbonisation, and as to the suitability of these bodies for internal combustion engines.

Sir Boverton Redwood said that as conditions had now changed with regard to labour and materials, the question of low temperature carbonisation should be thoroughly investigated on a commercial basis.

Dr. Ormandy thought that too much emphasis was laid on the production of ammonium sulphate, as other countries such as America and Germany were now large producers of this compound, and, possibly, supply would exceed demand. He also thought that the development of the lignite industry in Devon might result in the development of the pottery industry in that county, where the most suitable clays were found, but where the necessary fuel had hitherto been lacking.

Manchester Exhibition of British Science Products.—This exhibition, which is being conducted on the same lines as that held at King's College, London, last summer, was opened at the College of Technology, Manchester, on December 27 last, and will remain open daily until January 9.

NEWS AND NOTES.

UNITED STATES.

The Bucher Nitrogen Process.—The large plant for the manufacture of sodium cyanide by the much-discussed Bucher process was just about to begin operating when the armistice was signed. The question of its future has not yet been decided by the War Department.

Acetone.—Methods have been worked out whereby acetone may be prepared very economically from the waste gases of the Burton petroleum stills. The higher hydrocarbons are utilised and the steps in the process involve propylene to propyl alcohol to acetone.

Applications of Colloid Chemistry.—Knowledge of colloidal chemistry continues to lead to important commercial results. The use of colloidal graphite in oil as a lubricant is said to increase the life of aero motors using such lubrication by 200—300 per cent. Colloidal coal has been suspended in fuel oil with excellent results and marked advance may be expected in that direction. An entirely novel development is the perfection of a colloidal enamel or baking japan in water, no solvent being used. The article to be coated is first heated, and may then be sprayed, brushed or dipped, after which it is heated in an electric oven. Small pieces may be baked in the dipping basket without the work sticking since there is no solvent, and there is no tendency for the enamel to run on the work while being heated. The elimination of solvent is not only a saving but primarily a large factor of safety.

Proposed Industrial Uses for Chemicals used in War.—As phosgene can be produced in large quantities and at less than one tenth of its former cost, it will probably find application in chemical industry, *e.g.* as a reducing agent. Experiments have already been made on removing oxides of iron from sand required for making optical glass for military purposes. It is suggested that lachrymators would be useful in quelling mobs since the ill effects they cause are purely transitory.

The Chemical Warfare Service.—Much of the work done under such great pressure by the Research Section of the Chemical Warfare Service will probably be published as soon as the data can be assembled and edited.

The Industrial Relations Branch of the Chemical Warfare Service is now concerned with the task of aiding chemists in service to secure places in industry where their training and experience may be used to the best advantage. To this end the chemists are being asked concerning their desire to return to former positions or to take up work elsewhere, and manufacturers are being invited to state their requirements.

Vegetable Oils.—The United States in common with the rest of the world is using an ever-increasing quantity of vegetable fats. In addition to producing large amounts of cotton seed, peanut and similar oils, about \$75,000,000 worth of food oils was imported in 1917. To supply sufficient castor oil for aeroplane motor lubrication, 110,000 acres of castor beans were grown in the south this year, and efficient methods for working up the crop have been developed in the laboratory preparatory to constructing in Florida the largest castor oil plant in the world. The quantity of soya bean oil used in the arts is steadily increasing.

Utilisation of Breweries.—New uses have been found for the breweries made idle by recent legislation. Some who were unprepared are now actively seeking new lines of manufacture. One large plant is being converted into a food dehydra-

tor; another is very successful with malted milk; sweet, pasteurised cider has attracted a third, and maltose syrup is the product of several others. Maltose syrup has proved very useful during the sugar shortage, and it seems certain to maintain its place upon its merits.

JAPAN.

THE CERAMIC AND GLASS INDUSTRIES.—According to the latest report of the Department of Agriculture and Commerce, the number of ceramic works employing more than 15 hands is now 962, and the number of workers engaged therein is 49,293. Formerly the export trade was almost exclusively in porcelain toys and decorative porcelain ware, but since hand-working was replaced by machinery some ten years ago, the manufacture of ceramics may be said to have been placed on an industrial footing. The war has further stimulated its development, and particularly good progress has been made by the Nippon Porcelain Manufacturing Co., Nagoya, which is now making hardware dishes and cups, mostly for export. The Matsukaze Porcelain Co., Kioto, has successfully embarked upon the manufacture of electrical insulators. As regards raw material, a very good porcelain clay for hardware has been discovered quite recently in Korea, and a new firm, the Chosen Hard Porcelain Manufacturing Co., Fusan, has been established to exploit it. Sanitary ware is manufactured by the Toyo Porcelain Manufacturing Co., Kokura. The production of bricks, including fire-bricks, is much in excess of home demand, and there is a large export trade to the East. Slag bricks are made at the Government Iron Works, Yawata.

As regards the glass industry, the Asahi Glass Co. has succeeded in producing sheet and window glass, and it is exporting its products to neighbouring foreign markets. The Nippon Glass Industry Co. has recently purchased the Japanese rights in the Owen's patent bottle-making machine, and is preparing to work the machine at Hodogaya. Optical glass has long been imported, but thanks to the researches carried out by the Fuji Lens Works and the Japanese Navy preparations are now being made to manufacture it in Japan. The enamel industry is well developed, the Tokyo Gas and Electrical Industry Co. and three other big companies being always full up with orders. The company named has a big export trade in household utensils to Chinese and Australian markets, and owns a very large plant for making enamelled iron plates.

With few exceptions, the Japanese cement works have installed rotary furnaces, and their outputs have accordingly increased.

Value of Japanese Exports of Ceramic and Glass Wares

In Thousands of Pounds Sterling (10 yen=£1).

	1917	1916	1915
Porcelain	1447·3	1210·3	668·4
Window glass	311·6	—	—
Thermos flasks...	48·5	—	—
Other flasks and bottles...	439·8	370·8	176·2
Cups	169·6	197·8	86
Dishes, etc.	38·7	38·8	21·6
Beads	163·5	96·3	45·4
Mirrors	148	106·7	58·7
Spectacles	19·2	14·9	8·8
Other glassware	106·7	214	190·3
Total	2892·9	2249·6	1255·4
Cement	267·8	271·9	246·5
Enamelled ware	270·2	—	—

The exports of porcelain were distributed as follows:—

	1917	1916	1915
U.S.A.	494·1	419·1	291·9
China	198	125·9	47·7
India	121·9	116·8	51·6
Dutch Indies	112·1	52·4	25·6
Straits Settlements... ...	95·4	70·5	53·1
Australia	95·1	149·3	45
Manchuria	72·1	35·4	16·4
Hongkong	71·1	49·9	29·8
Canada	56	46·4	24·6
Philippine Islands	48·6	22·1	10·7
South Africa	17·2	12·9	1·8
England	6·4	48·5	65·9
Other countries	58·7	60·7	33·7
Total	1446·7	1209·9	697·8

The following table gives information concerning the markets for Japanese glassware:—

Exports of Glassware from 1915 to 1917.

	1917	1916	1915
India	435·7	299	194·7
China	298	191·2	132·9
Australia	116·5	152	80·2
Hongkong	87·4	44·2	27·4
Dutch Indies	80·3	53·4	29·2
U.S.A....	80·3	15·3	2·4
Philippine Islands	78·6	53·4	29·2
Manchuria...	78·2	35·2	29·8
Straits Settlements... ...	55·5	62·4	36·8
England	30·9	61·3	7·4
South Africa	23·7	29·2	3·6
Other countries	80·3	55	14·6
Total	1445·2	1051·6	588·2

(For Note on the Japanese Dye Market see Trade Notes, p. 482 of this issue.)

AUSTRALIA.

THE QUEENSLAND MINES IN 1917.—The State Mining Engineers' Report for 1917 shows that, but for a few exceptions, there has been a decline in output during the year under review. The chief exception was coal production, which in 1916 was 907,000 tons, valued at the pit's mouth at 8*s*. 7*d*. per ton, and in 1917, 1,048,000 tons, valued at 11*s*. 5*d*. In the copper mines at Mount Morgan and Cloncurry a considerable amount of development work has been carried out. The returns of the gold mining industry show that only a very small proportion of the ore-stamping batteries and cyanide plants have been in operation. The total value of all minerals raised (including gold) was £4,013,000. The coke produced amounted to 13,400 tons, and required to be supplemented by about 60,000 tons from New South Wales in order to meet the needs of the smelting furnaces. A number of boring operations have been carried out with satisfactory results, and some new seams of coking coal have been found. The efforts of the Department to increase the coke output have achieved very little success. The total number of men employed in collieries, mines, and smelters amounted to 11,100, about 600 less than in the previous year.—(*Bd. of Trade J., Dec.* 5, 1918.)

GENERAL.

THE APPOINTMENTS REGISTER OF THE INSTITUTE OF CHEMISTRY.—In drawing attention to its Appointments Register, the Institute of Chemistry states that many qualified chemists with valuable practical experience in analysis, in research, in plant control and management, will shortly be available; that it is now co-operating with the Appointments Department of the Ministry of Labour, which is concerned with the resettlement of officers, and that it is also in touch with a large number of chemists who have been engaged under the Ministry

of Munitions and in controlled establishments. Companies and firms are therefore invited to notify their requirements. These should indicate (i.) the industry, (ii.) the general nature of the duties to be entrusted to the chemists, (iii.) the salary and prospects attaching to the appointments, and (iv.) to whom replies should be addressed. For the more lucrative appointments, with prospects, a good selection of candidates may be expected.

Industrial Developments During the War.—Mr. F. G. Kellaway, Parliamentary and Financial Secretary to the Ministry of Munitions, gave an address on the above subject to the Industrial Reconstruction Council on November 29. In speaking of the electrical industry he referred to the former German control of mica. Although India produced 50 per cent., Canada 15 per cent., and German East Africa only 10 per cent. of the world's supply of this material, the mica market of the world was on the point of being transferred from London to Hamburg. When war broke out we stopped Germany's supplies, whereupon she tried to form a combine in a neutral country to impede production; and to some extent she was successful. The situation has now been restored, and Indian mica is exported to London only. Thanks to the measures taken, the British electrical industry is now the first in the world.

After dealing with the recent history of the tungsten industry (this J., 1918, 356 R), the lecturer spoke of ferro-chrome, the alloy used for making chrome steel for armour-piercing shells, armour plates, for the wearing parts of aeroplane engines, and gears in motor vehicles. Our pre-war production was practically negligible, and we imported our requirements mainly from Norway. A large works has now been established at Newcastle-on-Tyne, which uses the waste gases from coke-ovens for power, and which will be able not only to meet our requirements for many years to come but to compete successfully with Scandinavian countries.

Concerning zinc (this J., 1918, 188 R), Mr. Kellaway referred to our former dependence upon Germany and stated that our immediate needs at the outbreak of war were principally met by imports from North America. Then steps were taken to divert the future supply of Australian zinc concentrates from Germany to this country, and arrangements were made to increase greatly the capacity of our smelting plants. Unfortunately, before these extensions were completed, submarine activities completely cut off Australian supplies; but with this difficulty removed our home production of spelter should reach 140,000 tons per annum, as against 32,000 tons before the war. Our pre-war consumption was 240,000 tons.

In connexion with potash recovery from blast furnace gases, the design of the German Halberg-Beth recovery plant has been modified to ensure greater reliability and lower capital cost. Plants in hand and in course of erection should produce 18,000 tons of potash per annum. Further, the Ministry has initiated an entirely new method of potash recovery from these gases, and two large plants are being erected which should produce about 1600 tons per annum.

A great development in the production of machine tools has taken place. The yearly output before 1914 was valued at £4,000,000; for 1917 it was £6,500,000 based on pre-war prices, and actually £10,000,000. In general, engineering methods have been radically improved, and "it is now realised more than ever it was before, that science is the handmaid of production." In regard to aircraft, not only has the power of the engines been increased, but their weight per horse-power has been reduced to about one-third of what it was at the beginning of the war. Great strides have been made in producing magnetos, of which the yearly output in 1914 was 1140, whereas it is now 128,637. The monthly output at the beginning of the war was 100, in October last it was 18,000. The British magneto is superior to that made in Germany, both before the war and now. The production of mica sparking plugs has been increased from 5000 in 1914 to 2,148,726 for the year ending October 31 last. Finally, in the course of a review of the situation in the glass industry, Mr. Kellaway admitted that we very nearly lost the war owing to the dearth of scientific and optical glass, the output of which has now been increased twenty-fold. The value of the present turnover is more than £600,000 per annum. "Within a short period, by careful and judicious treatment, this country should be independent of outside supplies."—(*Bd. of Trade J.*, *Dec.* 5, 1918.)

British Association of Chemists.—A London section of this Association was duly inaugurated at a meeting held on November 29 at the Royal Society of Arts. The position of the movement, its relation to the Institute of Chemistry, and the programme of work to be done were expounded by the Hon. Sec., Mr. C. S. Garland, and by the Chairman, Prof. J. W. Hinchley (see this J., 1918, 378 R, 395 R, 414 R, 436 R). Mr. H. W. Rowell, general secretary, announced that the undecided question of registering the Association under the Companies Acts or as a Trade Union had been referred to two lawyers with a neutral arbitrator. Col. C. Cassal congratulated the Association on having decided to further the economic interests of chemists, as did also Dr. Brady, a member of the Council of the Institute of Chemistry, who further stated that he believed that the registration of the Association as a Trade Union would have the hearty support of most of the members of the Institute. After Mr. R. B. Pilcher had addressed the meeting on behalf of the Institute, a resolution was passed authorising the election of a local committee.

The Resources of German-Austria.—The *Neue Freie Presse* publishes an article comparing the resources of German-Austria with those of the other sections of Austria. The total Austrian iron ore output before the war was 1,140,000 metric tons, of which 70 per cent. came from German-Austria and the remainder from Bohemia. The Styrian iron deposits (of German-Austria) contain sufficient reserves to last more than a century, while the Bohemian reserves are fast diminishing, and the blast furnaces there are now working up large proportions of imported ores. Of the four great quality steel works in Austria, three are in German-Austria, and these have grown to such an extent that they can supply all the home demand and export considerable quantities to the Czech provinces (Bohemia, Moravia, and Silesia). In respect of coal German-Austria is badly situated, as all the Austrian coal and 80 per cent. of the Austrian lignite comes from Bohemia, Moravia, and Silesia. German-Austria, however, possesses a valuable source of power in the alpine waterfalls which should yield up to 1,500,000 horse-power.

Financially, the German-Austrian banks have much more capital than the Czech banks, and a large number of shares in Bohemian undertakings is in the hands of German-Austrian capitalists. The bulk of the large engineering works and electrical undertakings are situated in Lower Austria, and the factories have sufficient supplies of iron and timber within German-Austria. Immense supplies of timber exist in Inner Austria, in the Alps, and in the northern mountains, and during the period of reconstruction German-Austria should find ample and profitable opportunities for the utilisation of her timber resources both at home and abroad.—(*Bd. of Trade J.*, *Dec.* 5, 1918.)

Peat Briquettes.—Arrangements are being made in Belfast to commence on a large scale the manufacture of peat briquettes by a new process. Raw undried peat is macerated in mortar-mills, and a small amount of lime is added, together with a little bitumen. The mass is allowed to stand for a few hours and is then subjected to hydraulic pressure, which squeezes out surplus water, giving a briquette, which, after having been allowed to set for a short time, burns freely with a good flame.—(*Gas J., Nov.* 26, 1918.)

American Steel Combine.—A great combination of steel interests is in course of formation in America to compete with the United States Steel Corporation for foreign trade. More than 25 companies have agreed to pool their interests and send commercial representatives to every nation in Europe for contracts. It is estimated that the combine will be able to handle £20,000,000 of business annually. Mr. M'Adoo, who has just resigned the Secretaryship of the Treasury, will become the head of the combination.—(*Iron and Coal Tr. Rev., Dec.* 6, 1918.)

American Petroleum Resources.—The serious depletion and approaching exhaustion of the American petroleum supplies is viewed with some uneasiness. More than two-thirds of the world's output comes from the United States, and there is no doubt that the productive capacity of the country is exceeded by the present consumption. Whereas the world demand is increasing it will be impossible to maintain the present output during 1919. To prevent the failure of supplies it will be necessary to have recourse to the development of oil shales. The black shales of Utah, Colorado and Wyoming constitute in the aggregate an oil reserve that exceeds the original supply of petroleum. In Colorado alone the shales cover an area of 1400 square miles, with an average thickness of 53 feet. These Colorado-Utah shales are considered to be superior to those forming the raw material of the Scotch industry.—(*Engineering, Dec.* 6, 1918.)

Electric Re-melting of Aluminium Pig.—The United States Aluminium Company, of Massena, New York, which is credited with half of the aluminium production of the country, has recently adopted electric furnaces in the place of the oil furnaces (crude petroleum) formerly in use for re-melting the pig previous to its being cast into ingots. The new electric furnaces, which are continuous working, and each of which can deal with 1 ton of metal per hour, are especially suitable for the thermal treatment of volatile alloys, resulting in a considerable reduction in losses of metal, and giving more uniform mixtures.—(*Engineering, Dec.* 6, 1918.)

Estimation of Tar Fog in Coal Gas.—The Steere Engineering Company of Chicago has devised a method of making quantitative determinations of the suspended matter carried by gases. The apparatus consists of a piece of white paper through which a definite volume of gas can be drawn. The amount of tar in suspension is determined either by a comparison of the "tar picture" obtained with standard pictures, or by weighing the paper before and after passing the gas. The method is similar to one in use in this country for estimating the quantity of dust in suspension in the atmosphere, and can be applied to many gases in which fine dust is suspended. One or more filters may be necessary according to the nature of the dust.—(*Gas J., Nov.* 26, 1918.)

Ukrainian Ore for Silesian Iron Furnaces.—The interests of the Upper Silesian iron industry are now closely bound up with the development of the Ukrainian ore mines. On Ukrainian raw materials, Germany will, in the near future, find herself in large measure dependent. The production of the Upper Silesian blast furnaces can be maintained only by a considerable supply of Ukrainian ores. Already concessions have been purchased in the district of Krivog-Rog. According to a recent agreement the Ukraine will also deliver large quantities of iron and manganese ore to Austria-Hungary. A scheme is under consideration to form an Austro-Hungarian syndicate to control the imports.—(*Z. angew. Chem., Sept.* 3, 1919.)

Wolfram Ore from Hongkong.—The deposits of tungsten ore in South China (this J., 1918, 13 R, 154 R) have proved to be one of the most important additions to the world's supply of wolfram in recent years. Over 1800 tons of the ore have been exported from Hongkong alone during the current year. Shipments are now in full swing, the greater part of the ore has been purchased by middlemen from Chinese operators, the mining being done on a piece-work basis. There seems to be no reason for anticipating any reduction in the volume of the output.—(*U.S. Com. Rep., Oct.* 16, 1918.)

Danish Efforts at providing Oil Substitutes.—The shortage of oil in Denmark has led to numerous experiments being tried to find substitutes for the usual vegetable and animal oils. Thus no consignment of soya beans or other oil seeds has arrived in Denmark for more than a year. Mustard seed appeared promising, and 28,000 acres were planted during the present season. The yield is good, and the oil has been found to be adapted for both illuminating and lubricating purposes. Sunflower seeds have also been tried, the oil being capable of use in margarine manufacture. It was, however, too expensive for this purpose and attempts are being made to utilise it in making varnish for linoleum.

Flax is being grown for its seed, while poppy seed oil has been found to be quite satisfactory for certain varnishes. Beechnuts are being systematically collected for their oil content.—(*U.S. Com. Rep., Nov.* 5, 1918.)

New Argentine Argol Factory.—An Argentine company, in which American capital is largely interested, has completed the erection of a factory for the manufacture of argol and the extraction of oil from grape seed. The factory is located in the heart of the grape-growing district of Argentina.—(*U.S. Com. Rep., Nov.* 9, 1918.)

Supply of Oxygen for Technical Purposes in Switzerland.—Already at the outbreak of war Switzerland possessed oxygen factories at Lucerne, Berne, Turgi, Lenzburg, Rumlang and Schaffhausen, which had a total output and sale of 500,000 cubic metres of gas, and commanded the use of 12,000 steel cylinders. Since 1914 the demand for welding and cutting purposes has probably doubled, but there has been no fresh supply of cylinders. The Sauerstoff und Wasserstoffwerk in Luzern-A.-G. has established new works at Vevey, Locarno, and Basel in order to alleviate the difficulty of transport. The Schweizerische Kohlensäurewerke A.-G. in Bern has greatly extended its plant for manufacturing oxygen.—(*Z. angew. Chem., Oct.* 8, 1918.)

Production of Otto of Roses in Bulgaria.—According to the *Deutsche Balkanzeitung*, the yield of otto of roses is considerably less this year than in 1917, climatic conditions having been unfavourable. The price paid for rose leaves has averaged 60 stotinki per kilo. ($2\frac{3}{4}d.$ per lb. at normal exchange). The leaves of the 1918 crop being of inferior quality, 300 lb. were needed for the manufacture of 1 oz. of oil, as against 185—200 lb. in 1917. In favourable seasons the production of oil of roses amounted to about 11,000 lb. per year; it is expected to reach only about 6600 lb. this year.—(*U.S. Com. Rep., Oct.* 3, 1918.)

CHROMITE IN 1917.—The normal consumption of chromite in the United States is about 65,000 tons, although the estimated requirements during 1918 are about 130,000 tons, of which 67,500 tons is for ferro-chrome, 40,000 tons for bichromate and other chemicals, and 22,500 tons for refractory purposes. Chromite is the only mineral of commercial importance as a source of chromium, the higher grades of ore containing 40—50 per cent. of the oxide. The production of chromite in 1917 in the United States was 43,725 tons (chiefly from California and Oregon), or 3000 tons less than in 1916, the difference being attributed to low prices and an uncertain market. To increase production an appeal, including an offer to pay a minimum of 5*s.* 3*d.* per unit for 38 per cent. of chromic oxide, was sent out by one company in March last. It is hoped that users of ore with less than 38 per cent. of chromic oxide will adopt a minimum price per unit, so as to stabilise prices and stimulate production. Several plants for concentrating the low grade ores are in use in California and Oregon. The bulk of the chromite imported into the United States in 1917 was from Portuguese Africa (38,000 tons), Canada (19,000 tons) and French Oceania (10,000 tons). In addition 22,025 tons of chromate and bichromate of soda was imported.—(*U.S. Geol. Surv., Aug.*, 1918.)

FELSPAR IN THE U.S.A.—According to F. J. Katz, in the United States felspar is used principally in the manufacture of ceramic products (82 per cent.), as an abrasive (2 per cent.), a constituent of scouring soaps ($2\frac{1}{2}$ per cent.), chicken grits (1 per cent.), for surfacing concrete roofing work (6 per cent.), and for enriching the dusts for potash extraction (5 per cent.). Small quantities are also used for artificial teeth. The extraction of potash from felspar for fertiliser purposes is largely in the experimental stage. The marketed production of felspar in the United States in 1917 was 126,000 tons, with a value of £145,000, an increase of 7 per cent. over the yield of 1916 and the highest on record. About 70 per cent. of this quantity was sold crude and 30 per cent. in the ground state, but owing to the manner in which the information is reported, the figure for ground felspar should be higher than that given. The felspar is obtained chiefly from North Carolina, Maine and Maryland, but considerable quantities are supplied by California, Connecticut, New York and Pennsylvania. Almost the whole of the felspar imported into the United States in 1917 was from Canada, which supplied 10,000 tons.—(*U.S. Geol. Surv.*, 1918.)

MANUFACTURE OF PAPER PULP FROM ALFA GRASS.—The announcement of the organisation by the "Société Nord-Africaine d'Etudes," Algiers, of a company called the "Société des Celluloses de l'Afrique Française du Nord" for the manufacture of paper pulp from alfa, gives some indication of post-war development of industry in Algeria. The capital of the company in formation is 3,000,000 francs (£120,000).

Algeria has an almost unlimited supply of alfa in the Department of Oran. It is stated that there exist in Algeria 12,355,220 acres of alfa, which could give a possible annual production of 400,000 metric tons. Lack of tonnage during the war has heavily curtailed the shipments of alfa, which was exported principally from the ports of Oran and Arzew. About nine-tenths of the shipments went to Great Britain, where alfa is largely used in paper manufacture (see also this J., 1918, 301 R).—(*U.S. Com. Rep., Oct.* 1, 1918.)

THE RUSSIAN FAT INDUSTRY.—According to the Russian journal *Industry and Trade*, the chief exports of fats and raw materials before the war were as follows: Butter, oil seeds, small quantities of vegetable oils (sunflower, linseed, hemp and cottonseed), animal fats and copra. In the year 1913, the excess of exports over imports was about 75,000 (long) tons of butter and about 37,000 tons of oilseeds, but the imports of animal fats exceeded the exports by about 40,000 tons. The proposal to plant the soya bean in South Russia, where the conditions are eminently suited for its cultivation, did not get beyond the experimental stage.

Fat-hardening has considerably developed during the war. According to official statistics 177 tons of solid fats was manufactured in 1910, 659 tons in 1911, and 1318 tons in 1912. Private advices state that nearly 13,000 tons was produced in 1913, and at the present time the factories are manufacturing at the rate of 1600—1900 tons monthly. At the present time there is a shortage of vegetable oils, as they are being consumed for edible purposes; the output for 1917 was expected to be 282,000 tons (390,000 in 1913). Sunflower oil is the most important; in 1916 the total acreage of European Russia, exclusive of occupied territory, devoted to the cultivation was 2700 sq. miles.—(*Z. angew. Chem., Oct.* 15, 1918.)

BEET SUGAR PRODUCTION IN RUSSIA.—The output of beet sugar in Russia (including the Ukraine and Poland) has fallen about 60 per cent. since 1914. The last recorded output (1917—1918) was 800,000 long tons.—(*Z. angew. Chem., Oct.* 15, 1918.)

RUMANIAN SUGAR INDUSTRY.—Recent military developments in the Balkans give interest to an announcement from Bucharest to the effect that only the ready co-operation of the large landowners is needed to establish an important sugar industry in Rumania. Already seven large factories exist in different parts of the country. The climate and soil, particularly in Moldavia, are favourable to the cultivation of the sugar-beet.—(*Z. angew. Chem., Sept.* 10, 1918.)

POTASH DISCOVERY IN SASKATCHEWAN.—With reference to the note under this heading which appeared in our issue of October 15 (p. 378 R), and which was obtained from an official source, we are informed by the Director of the Mines Branch of the Department of Mines, Canada, that his department has not yet received any information which would lead to the conclusion that a potash deposit of economic importance has been discovered in Western Canada.

LEGAL INTELLIGENCE.

CARBONATE OF MAGNESIA CONTRACT DISPUTE. *A. Harding and Co., Ltd.,* v. *G. F. Berry.*

The new trial ordered by Mr. Justice Bailhache (this J., 439 R, also 250 R), was heard by Mr. Justice Rowlatt on November 29. The chief point at issue was whether the carbonate supplied by the defendant was according to contract. Expert evidence given for the plaintiff company was to the effect that the material supplied did not contain the proportions of ingredients corresponding to light carbonate of magnesia, *viz.*, MgO 42%, CO_2 34—35%, and combined water 22—25%. The material was found to be so wholly crystallised that it could not conform to the contract description. One expert witness for the defence said he had found CO_2 31·6%, and combined water 16·2%; and another deposed that the sample analysed by him contained CO_2 32·2% and combined water 18·4%, and that these slight variations would not affect the commercial quality of the article. His Lordship, in giving judgment, said he had come to the conclusion that the goods were carbonate of

magnesia as contracted to be sold, and he gave judgment for the defendant with costs.

SEIZURE OF SHIPMENT OF ACETIC ACID. In the Prize Court, on December 3, the President, Lord Sterndale, condemned as prize 76 tons of acetic acid consigned on the S.S. Noorderdijk to the claimants, Messrs. Vermet and Fuchs of Holland, who contended that the shipment was destined for a neutral country and not for Germany. In the course of his judgment, the President said that the claimants without doubt carried on the legitimate business of concentrating weak acid by distillation, and of selling glacial acetic acid to England, British colonies and neutral countries. The firm had previously been fined 50,000 florins by the Netherlands Overseas Trust for selling acetic acid without taking any guarantee against re-export, the acid being subsequently exported to Germany. The claimants' explanation was that the goods in respect of which they were fined were not made out of material which came from overseas and therefore the Overseas Trust had no case. The process used was a secret one, the nature of which they could not disclose, the materials used were not imported, and not dutiable, and therefore it was not necessary to give a guarantee; further they had sold them to a former manager of their own whom they thought they could trust. In the present case claimants maintained that, at their request, their London agent had procured orders in this country for 76 tons of acid, but there was nothing to show that any sales had been specifically made against the lot of 76 tons seized. In view of the past history of the firm, his Lordship said he was not satisfied that no part of the consignment was intended for Germany, and therefore there must be condemnation with costs.

BONE-PHOSPHATE CONTRACT DISPUTE. *W. R. Smith and Sons v. Victors, Ltd.*

In the King's Bench Division, on December 3, Messrs. W. R. Smith and Sons, of Chester, sought to set aside the award of the arbitrator in a dispute as to the supply of boiled bones for the manufacture of phosphates. Smith and Sons entered into contracts to supply bones to Victors, Ltd., of Stalybridge, but found it difficult to supply the grade stipulated. They accordingly suggested that they might be permitted to supply some of a lower grade, and contended that the contracts were so altered as to permit them to supply the lower grade at £2 a ton less up to a certain date and afterwards *pro rata*. On the other hand Victors asserted that they never agreed to any modification of the contracts. The award of the arbitrator upheld this contention and the court confirmed the award.

SALICYLIC ACID PLANT. *Lennox Foundry Co. v. Warrington Drug and Chemical Works, Ltd.*

On December 9, in a King's Bench Divisional Court, Justices A. T. Lawrence and Rowlatt had before them an appeal by the Lennox Foundry Co., of New Cross, London, against a judgment by Mr. Muir Mackenzie, one of the official representatives of the High Court, in favour of Mr. J. H. Whittaker Tors, trading as the Warrington Drug and Chemical Works (this J., 1918, 156 R). Plaintiffs before the Referee sought to recover the sum of £220 as part payment under a contract for supplying plant for the manufacture of salicylic acid. The Official Referee found that the plaintiffs had broken their agreement, as the plant which they supplied was not of a capacity to produce the stipulated quantity. He gave judgment for defendants in the claim and counter-claim for £530. From this judgment plaintiffs appealed.

The appeal was allowed with costs and judgment entered for the plaintiffs on the claim for £220 and £5 8*s*. paid into court on the counter-claim with costs.

THE MERSEY CHEMICAL WORKS, LTD. *Winding Up Order.*

An application was made by the Board of Trade in the Chancery Division on December 5, before Mr. Justice Younger, under the Trading with the Enemy Acts, for the winding up of the company, Mersey Chemical Works, Ltd.

Mr. Austen Cartmell, who appeared for the Board of Trade, said this was one of the first German dye companies over which a controller was appointed under the Act of 1914. At that time it was considered to be most material that the business should be carried on in the interests of the country. Under the Act of 1916 an order was made to wind up the business of the company, and the controller already appointed was to act as the liquidator. Everything had now been realised, the works had been sold, and there was no alternative to the winding up of the company itself. Counsel said that all the shares with the exception of one were held by enemies, so that this was obviously an enemy company.

His Lordship made the usual order.

REPORT.

THE MINERAL RESOURCES OF THE UNITED KINGDOM.

REPORT OF THE CONTROLLER OF THE DEPARTMENT FOR THE DEVELOPMENT OF MINERAL RESOURCES IN THE UNITED KINGDOM. [Cd. 9184, 6*d*.]

This report is published as the statement of the personal views of Sir Lionel Phillips, Bart., the late Controller of this Department.

The British Isles have probably been endowed with greater mineral wealth than any area of equal size on the globe. Vast quantities of coal still remain, and although the high grade iron ores are diminishing, enormous bodies of lower quality are available. Limestone, clays, slates, salt, sand and barytes are also abundant. Beyond these important minerals no great reserves are known. Cannel coals and shales can only produce insignificant quantities of mineral oils compared with national requirements. The tin mines of Cornwall although still capable of further extension—especially as regards deep deposits which require unwatering—produce only a fraction of the national consumption. There is, however, an important field for investigation in the yield of tin from the ores. At present only 65 per cent. of the metal is extracted, the remaining 35 per cent. being left in the tailings. Over the last 60 years the total loss in this way has amounted to over £20,000,000. A Research Fund has been started and the Tin and Tungsten Research Committee is attacking the problem. Appreciable quantities of zinc and lead are being produced but reserves are comparatively small. Copper mining has practically ceased, the richer deposits being exhausted. At the middle of the 19th century Cornwall was the premier copper producer of the world. During the war the output of wolfram has been greatly increased, but the production is never likely to exceed one-eighth of the consumption.

The Caecock Pyrites Mine (Carnarvon) has been worked by the Department and large quantities of pyrites assaying 38 per cent. sulphur have been produced. It is extremely doubtful whether such material could compete with Norwegian or Spanish pyrites in normal times.

As a war-time measure the coprolites in Cambridgeshire have been mined, but the cost of production exceeded the pre-war cost of imported phosphates.

With a few exceptions, none of the non-ferrous metals are likely to be worked at a profit against the competition of the world in normal times unless special action be taken to render them remunerative.

Internal railway rates are excessive and singularly erratically applied; and dumping and unfair competition must be met if the industries are not to be extinguished. Although the war has been responsible for decreased production during the last 4 years, nevertheless there has been a steady decline during the last 60 years due to impoverishment, exhaustion, increased costs of ore extraction and pumping, and low prices of the metals.

The following table compares the production (average for the last 5 years) with the estimated normal consumption (excluding war demands):—

	Production	Consumption
Iron	4,600,000 tons	7,000,000 tons
Tin...	5,100 ,,	21,000 ,,
Lead	17,000 ,,	179,000 ,,
Zinc	4,800 ,,	185,000 ,,
Copper...	140 ,,	130,000 ,,
Manganese (ore)	4,500 ,,	400,000 ,,
Wolfram	260 ,,	4,000 ,,

That the new Department has succeeded in stimulating interest in mining activities is shown by the estimated outputs for 1918:—

	1916	1918
Lead	17,000 tons	25,000 tons
Tin	7,800 ,,	9,000 ,,
Zinc	8,400 ,,	14,000 ,,
Wolfram	400 ,,	700 ,,

In the past the mining industry has been left to individual enterprise and no community of interests has been fostered between various mining undertakings, and mining is too often regarded as a gamble rather than an industry.

As regards royalties, the Controller refers in detail to the findings of the Royal Commission of 1889—1893, the excellent recommendations of which have been completely ignored. As a rule royalties are not excessive, but generally they are paid on the gross value of the output, which leads in some cases to very unfair results, in that mines are paying royalties although working without profit. There is evidence that in some cases developments have been obstructed by landowners, and it is suspected that in many instances lessees of minerals have worked out large bodies of rich ore, pocketed considerable profits without spending a penny for future development, and finally left the property derelict as soon as the rich seam was exhausted.

The taxation of mines is a thorny question that requires to be approached in a very broad spirit. It must be realised that while mining profits should be taxed just as income from any other industry, dividends paid by mining companies consist not only of income but include the return of capital, since when the mine is ultimately worked out the whole capital disappears except for the break-up value of the plant. It is urged that the State should favour the practice of allowing for such depreciation by exempting reserve funds from income tax. Similar encouragement should also be given to the expenditure of profits in development work. Such steps would tend to lessen the gambling element and improve the industry from the national standpoint. The excess profits tax has had a most discouraging influence upon mining enterprise.

The mineral industries require for their supervision and assistance a more elaborate department than that which exists, and it is recommended that a comprehensive Mines Department be formed. This Department would take over and extend the work at present performed by a number of departments, collect full information respecting the mineral industries of the country, and generally foster mining interests somewhat on the lines of the Canadian Department of Mines and the U.S. Bureau of Mines. The Geological Survey, which is well administered as far as its present limited staff will allow, should be linked with the Mines Department, and its work extended, especially in the direction of economic geology.

The Department should be advised by at least three small qualified committees:—(*a*) The Imperial Mineral Resources Bureau—forming a link with the self-governing Dominions; (*b*) the Mines and Minerals Commission—to watch and foster the interests of the Empire in output and trade in mineral and metallic products; (*c*) Commissioners authorised to take action in cases of improper exploitation of properties, or unreasonable or prohibitive conditions imposed by landowners for royalties and wayleaves.

The Department should also administer a special fund for the purpose of carrying out experimental work, such a fund to be as far as possible self-supporting by receipt of payment on successful results.

The labour question is discussed fully. It is pointed out that the general rate of wages is low compared with other industries. In many localities it has long been customary for men to be engaged partly in mining and partly in agriculture, a system which is not conducive to good work in either sphere.

The report contains an enormous amount of information, with which it is impossible to deal in an abstract: it forms a complete account of both the past and present conditions of all the mines of any importance in the Kingdom. The bulk of the information has been collected by personal visits of the departmental engineers, as no systematic record of mines has previously been kept.

OFFICIAL TRADE INTELLIGENCE.

(From the *Board of Trade Journal*, December 12 and 19.)

OPENINGS FOR BRITISH TRADE.

An agent at St. John, New Brunswick, wishes to represent U.K. manufacturers of dyes, hardware and chinaware. [Ref. No. 381.]

A firm at Auckland wishes to get into touch with U.K. manufacturers of aluminium, glassware and crockery. [Ref. No. 384.]

A firm at Hawera, Taranaki, New Zealand, desires agencies for U.K. manufacturers of tyres and exporters of salt. [Ref. No. 408.]

A firm at Cape Town desires agencies for U.K. manufacturers of paints, oils, glass and chinaware. Inquiries should be addressed to The South African Trade Commissioner, 90, Cannon Street, E.C. 2.

An agent at Arras wishes to represent U.K. manufacturers of oils and all kinds of food products. [Ref. No. 390.]

An agent at Paris seeks agencies for U.K. manufacturers of food products, chemical manures, chemicals and soap. [Ref. No. 414.]

A firm at Rotterdam desires sole agencies for U.K. manufacturers of Portland cement and artificial manures. [Ref. No. 396.]

A Netherlands firm wishes to obtain agencies for U.K. manufacturers of caustic soda. [Ref. No. 398.]

Agents at Barcelona desire to represent U.K. manufacturers of chemicals, paints and dyes. [Ref. Nos. 399, 400.]

An agent at Rome desires to represent U.K. manufacturers of chemicals, soap, etc. [Ref. No. 416.]

An agent at Chicago wishes to represent U.K. manufacturers of china, glass, earthenware, and high speed steel. [Ref. No. 401.]

A London firm desires to get into touch with U.K. manufacturers of, *inter alia*, hardware, metals, paints, colours, varnishes, and glassware, with a view to obtaining sole agencies for South America. Inquiries should be addressed to The Secretary, Statistical and Information Department, 97, Cannon Street, E.C. 2.

TARIFF, CUSTOMS, EXCISE.

Argentina.—The internal revenue tax on medicinal specialities and toilet articles has been amended.

Belgium.—A decree, dated November 8, provides that the import and export of all foods shall be effected only under licence issued by the Minister for Economic Affairs.

By a decree, dated November 15, the traffic in alcoholic liquors is restricted for the present. The restrictions do not apply to scientific, industrial, and medicinal uses.

British India.—The export of linseed is prohibited to all destinations except to the U.K., as from September 28.

France (Indo-China).—Export duties have been levied, as from November 23, on certain metals and ores, including tin and tungsten.

Johore.—On and after November 1, cultivated rubber may be exported free of duty subject to the issue of a Customs export permit.

Netherlands.—The export of soap substitutes is prohibited, as from November 4.

Sierra Leone.—The export of French and American currency notes is prohibited to all destinations, except to destinations in France and America respectively.

United States.—New regulations concerning the export of manufactures containing gold came into force on November 16.

The War Trade Board announces the issue of a new General Import Licence, to be known as "P.B.F. No. 28," to cover imports of sugar from all destinations when consigned to the Sugar Equalisation Board.

Iridium, palladium, platinum and rhodium have been removed from the Export Conservation List, as from November 20.

GOVERNMENT ORDERS AND NOTICES.

PROHIBITED EXPORTS.

Two further lists of articles upon which the export prohibitions have been relaxed have been issued by the Board of Trade (and subsequently confirmed by Orders in Council). The relaxations became valid on December 20 and 27 respectively.

Headings to be transferred from one list to another.

From List A to List B:—

Lactic acid.—(Dec. 20.)
Vanillin.—(Dec. 27.)

From List A to List C:—

Fenugreek seed; glass for optical instruments; iron and iron articles containing chrome, cobalt, molybdenum, nickel, tungsten or vanadium; ochres and mixtures containing ochres; siennas and mixtures containing siennas; umbers and mixtures containing umbers; iron, oxides of, and mixtures containing iron oxides.—(Dec. 20.)

Acetanilide; acetates, all metallic; ambergris; amyl acetate and other amyl esters; benzoic acid (synthetic) and benzoates; bone black; chloral and its compounds and preparations; grindelia; hexamethylene tetramine (urotropin) and its compounds and preparations; lactates not otherwise prohibited; lobelia; magnesite and magnesite bricks; magnesite, caustic or lightly calcined and dead burnt magnesite, magnesium and its alloys; serpentary rhizome; silica bricks.—(Dec. 27.)

From List B to List C:—

Corks, crown; plumbago; magnesium chloride and sulphate and mixtures containing.—(Dec. 20.)

Aconite root; aloes; araroba or Goa powder; barium peroxide; calabar beans; cannabis indica (Indian hemp); cascarilla bark; catechu; chiretta; chrysarobin; cobalt, cobalt ore and alloys of cobalt; colchicum and its preparations; colocynth; cubebs; damiana; gelsemium root; gentian root; ipecacuanha root; jaborandi leaves; lactic acid; methyl salicylate; nux vomica alkaloids and their preparations; oxalic acid; pyrogallic acid and mixtures containing; quassia wood; rhatany root; salol and its preparations; senna leaves and pods; sodium hyposulphite (thiosulphate) and mixtures containing; sodium peroxide; sodium prussiates and mixtures containing; stramonium leaves and seeds; strophanthus seeds; thorium, oxide and salts of.—(Dec. 27.)

Altered Headings.

(A) Albumen other than blood albumen; (C) blood albumen; (A) barium sulphate; (C) mixtures containing barium sulphate not otherwise prohibited; (A) coal tar, all products obtainable from, and derivatives thereof (except solvent naphtha, cresylic acid and mixtures containing cresylic acid) suitable for use in the manufacture of dyes and explosives, whether obtained from coal tar or other sources, and mixtures and preparations containing such products or derivatives; (C) cresylic acid and mixtures containing cresylic acid; (A) cocoa, raw, and manufactures thereof except cocoa butter; (B) cocoa butter; (A) gum arabic; (A) gum tragacanth; (C) gums not otherwise prohibited; (A) molasses and feeding-stuffs containing molasses; (C) articles, mixtures and preparations containing molasses not otherwise prohibited.—(Dec. 20.)

(A) Glue, osseine and concentrated size (and other size and sizings made from glue), finings, and other kinds of gelatin; (C) fish glue; (A) glue stock of all kinds, including animal hoofs, untanned hides and pelts not otherwise specifically prohibited.—(Dec. 27.)

Exports to Holland. The Director of the War Trade Department announces that in order that effect may be given to the terms of the recent agreement with Holland, it is necessary for fresh N.O.T. certificates to be obtained in support of applications for licences to export certain goods. The list is of general application, and it may not be possible to grant licences for the export from the United Kingdom of all the classes of goods specified therein.—(*For list v. Bd. of Trade J.*, Dec. 19, 1918.)

Exports to Neutral Countries in Europe. The following are the chemical items in a long list of articles which may now be exported to neutral countries in Europe from the U.K., France, Italy or the United States. The articles shown in italics remain on the prohibited list and retain their present classification, and therefore licences are required for their exportation.

China clay; *Acetyl salicylic acid; aconite;* agaric; althaea root; amidol and substitutes; argentamin; arsenobillon; arsenious acid; barium

sulphate; *beta naphthol*; *bromine*; *butylchloral-hydrate*; cacodylicate; *camomile*; chromic acid; diethylbarbituric acid; *digitalis*; duboisin sulphuric; eucaine; *ferric compounds; ferrum reductum; folia hyoscyami; fructus foeniculi; hydrobromic acid*; ichthyol; inula root; kharsevan; metol; *nitrate of silver*; *opium, alkaloids of*; paraldehyde; phenacetin; salicylic acid; saltcake (subject to special conditions); sodium arsenate; *sodium bromide*; *sodium nitroprusside*; sodium salicylate; veronal sodium; *dyes and dyestuffs*; glassware; ink, other than printers' ink; marble, raw and manufactured; *medicines, proprietary and patent*; *perfumery, including essential oils*; pumice stone; *salt, table*.—(*For complete list v. Bd. of Trade J.*, Dec. 12, 1918.)

Export Prices of Iron and Steel. The Ministry of Munitions has issued lists of fixed prices for iron, steel and pig iron destined for exportation.—(*v. Bd. of Trade J.*, Dec. 12.)

IMPORT PROHIBITIONS.

A general licence has been issued to permit of the import of any quantity of gum copal and gum kauri. The licence will be valid until March 1, 1919.

The Department of Import Restrictions of the Board of Trade notifies that the Permit to Purchase system, which has applied since March last to all imports of goods from America, has now been abandoned. In regard to goods on the list of prohibited imports and not liberated by means of general licence, it is still necessary to procure authority for importation before shipment is made. The abolition of the permit system, or the freedom from export restriction in the United States of America, does not confer upon any prohibited goods the right of entry into the United Kingdom without a licence, and will not be accepted as a defence of irregular importation.

PETROLEUM PRODUCTS.

By an Order, dated December 13, 1918, the Board of Trade may from time to time, by giving notice, vary the prices contained in the schedule to the Petroleum Products (Wholesale Prices) No. 4 Order, 1918 (this J., 1918, 462 R). The new Order is to be known as the Petroleum Products (Wholesale Prices) Amendment Order, 1918.

In accordance with the provisions of the above Order, the Board of Trade gave notice, on December 14, that the following wholesale prices are now to hold:—

From Dec. 16, 1918. Gas oil in bulk, ex wharf, $8\frac{1}{2}$*d.* per gallon. Fuel oil, ditto, £10 per ton.

From Jan. 1, 1919. Spirit in cans, per gallon: Aviation, 3*s.* 2*d.*; special boiling points, 2*s.* $11\frac{1}{2}$*d.* No. 1, 2*s.* $10\frac{1}{2}$*d.*; No. 2, 2*s.* $9\frac{1}{2}$*d.*; No. 3, 2*s.* $8\frac{1}{2}$*d.* Kerosene, per gallon: Long time burning oil in bulk, 1*s.* 3*d.*; No. 1, 1*s.* 3*d.*; No. 2, 1*s.* 2*d.* Raw white spirit, as imported ungraded and unrefined, sold by the Pool Board to manufacturers, for distribution in accordance with licences issued by the Ministry of Munitions, 2*s.* 3*d.* per gallon. All delivery charges remain as before.

OTHER ORDERS AND NOTICES.

The Timber Control (Amendment) Order and the Timber Control (Amendment No. 2) Order, 1918. Board of Trade, Dec. 5.

The Home Grown Timber Prices (Amendment) Order, 1918. Board of Trade, Dec. 5.

The Cranes (Revocation) Order, 1918. Ministry of Munitions, Dec. 6.

The Motor Engines and Vehicles (Revocation) Order, 1918. Ministry of Munitions, Dec. 6.

The Motor Spirit and Gas Restriction Orders Suspension Order, 1918. Board of Trade, Dec. 7.

The Shellac Revocation Order, 1918 (revoking the Shellac Control Order of March 12, 1918; this J., 1918, 119 R). Ministry of Munitions, Dec. 10.

The Woollen and Worsted (Consolidation) Amendment No. 5 Order, 1918. Army Council, Dec. 10.

The Imported Flax (Dealings) Amendment Order, 1918. Army Council, Dec. 10.

The Boilers Revocation Order, 1918. Ministry of Munitions, Dec. 13.

The Chrome Ore (Suspension) Order, 1918. Ministry of Munitions, Dec. 17.

The Tin Suspension Order, 1918. Ministry of Munitions, Dec. 17.

The War Office has notified the withdrawal of the following Orders, etc.:—

The Raffia (Control) Notice, 1917, and the Raffia (Prices) Order, 1917, Dec. 9.

The Flax (Restriction of Consumption) No. 3 Order, Dec. 10.

The Sea Island Cotton Order, 1918, and the following (Dec. 16): The Sheep and Lamb Pelts Order, 1917; the Basils and Sheep Pelts (Dealings) Order, 1917; the Imported Sheep and Lamb Skins (Dealings) Order, 1917; the British Lamb Skins Order, 1917; the Sheep and Lamb Pelts (Amendment) Order, 1917; the Sheep and Lamb Pelts (Ireland) Order, 1917; the Cape Sheep Skins (Control) Notice, 1918; the Domestic Sheep Skins Order, 1918; the Domestic Sheep Skins (Amendment) Order, 1918.

Government Metal Stocks. In order that the trade may know the position in regard to stocks of the important metals, the following particulars are published of the stocks (exclusive of old metal and scrap) in this country in the possession of the Minister of Munitions on December 1, 1918: Copper, 27,530 tons; spelter, G.O.B., 18,768; spelter, refined, 6,544; aluminium, 10,215; soft pig lead, 49,111; nickel, 1,735; antimony regulus, 3,303. It is intended to publish, at monthly intervals, the stocks held on the first day of each month. The Minister also holds large quantities of scrap, mainly brass, of which it is impossible to give any figures at present.

Water-power Resources: Ireland. The Board of Trade has appointed the following Sub-Committee of the Water-Power Resources Committee to inquire into and report to the Committee upon the subject so far as it affects Ireland: Sir John Purser Griffith (chairman), Dr. J. F. Crowley (vice-chairman), Mr. T. M. Batchen, Mr. G. Fletcher, Mr. L. J. Kettle, the Earl of Leitrim, Mr. J. C. White. The Secretary to the Sub-Committee is Prof. H. H. Jeffcott, to whom all communications should be addressed at the Board of Works, Dublin.

PUBLICATIONS RECEIVED.

Power: Its Significance and Needs. *The Mineral Industries of the United States. By* C. G. Gilbert *and* J. E. Pogue. *Bulletin* 105, *Part* 5. (*United States National Museum.*) *Pp.* 53. (*Washington: Government Printing Office.* 1918.)

Tables of Chemical and Physical Constants. *Of Special Interest to the Light Naphtha Section of the Coal Tar and Coke Oven Industries. By* P. E. Spielmann. *Including Weight-Gallonage Conversion Tables and Dip-Gallonage Tables for Travelling Tank Wagons. Calculated by* E. G. Wheeler. *Tables XXIV.* (*London: H.M. Stationery Office.* 1918.) *Price* 4*s.* 6*d.*

REVIEWS.

ELECTROMETALLURGY: ELECTROLYTIC AND ELECTROTHERMAL PROCESSES. *By* E. K. RIDEAL. *Pp.* xii + 247. *(London: Baillière, Tindall and Cox.* 1918.) *Price 7s. 6d. net.*

A really up-to-date book on electro-metallurgy has been overdue (in England at least) for some time past. The great advances made in this subject during the last few years, especially under the stimulus of war emergencies, have rendered many of the older text-books quite inadequate. Dr. E. K. Rideal is, therefore, to be congratulated upon a very readable and interesting production which is certain to find a welcome among electro-chemists. The book is divided into eight sections, with an introduction and an appendix. Unfortunately the first nine pages and the appendix are far the most unsatisfactory parts of the book, and should be entirely rewritten at the first opportunity, as they give quite a wrong impression of the value of the work. The dangerous expedient of neglecting temperature coefficient when calculating electromotive forces is recommended, ionised salts are stated to obey the law of mass action, pressures and concentrations are badly confused, and the greater part of the information on overpotential is quite incorrect. The dependence of overpotential upon valency is not mentioned, and incorrect values are given for the electrolytic potentials of iron, nickel, and cobalt. These values are also utilised in other parts of the book. It is also unfortunate that the German method of applying the positive sign to the potential of the zinc electrode has been adopted. This is most confusing to a student who finds that although a zinc plate is strongly negative with respect to a hydrogen electrode, its potential is labelled + 0·77 volt.

The remainder of the chapter is in marked contrast to the earlier part. The section on power is very good, and as up-to-date as possible under the present conditions, and the section on Metalliferous Resources of the British Commonwealth is both useful and interesting.

Section I. deals with electrolysis in aqueous solutions, and is full and well written, especially the parts dealing with recovery of metal from ores. The possibilities of further improvement in these processes are clearly shown. The section on copper refining is somewhat restricted, and no mention is made of the Hayden system. It is also noticeable that of 107 references, only two are less than four years old.

Sections II. and III., dealing mainly with fused electrolytes, are good, but the question of costs is not discussed for such metals as lead and zinc. Hence we are unable from the data given to compare the relative merits of the processes described here and elsewhere in the book. A fuller description of the preparation of cerium for pyrophoric alloys would greatly add to the value of Section III.

Sections IV., V., and VI. deal with electrothermal processes, and the extraction of zinc and copper from ores is well described. Tungsten deserves more attention than is given, and the same may be said of nickel. Section VII. on nitrogen fixation is the most interesting and the best written part of the book. It is perhaps the most successful attempt so far made to present in a fair and unbiassed manner the respective merits of the many processes in use. This section is so good that one would like to see it extended to include a full description of the furnaces used, together with a short account of other non-electrical competing processes.

In Section VIII. a useful account of electrolytic iron is given. The descriptions of the induction furnaces are somewhat hard to follow, especially in the absence of sufficient diagrams. The ferro-alloys deserve more attention, and notes as to the properties and uses of each would add to the interest of this section.

References throughout the book are very full. Some sections suffer from lack of diagrams, and the absence of photographs of actual plant in operation is a somewhat serious drawback to the thorough understanding of many excellent descriptions in the text.

E. NEWBERY.

THE CHEMISTRY OF SYNTHETIC DRUGS. *By* P. MAY. *Second edition, revised and enlarged. Pp.* 250. *(London: Longmans, Green and Co.* 1918.) *Price* 10*s.* 6*d. net.*

This is a very interesting book dealing with a department of chemistry which appeals to an ever-widening circle of chemists and physiologists. Since the book was first published in 1911, the manufacture of many of the synthetic drugs referred to has been established in Great Britain and in the United States of America. This fact, together with the need for recording recent developments, makes a new edition very welcome.

The book, as the author claims, is more than a mere description of the chemical nature and mode of preparation of many synthetic drugs, for wherever possible attention is drawn to their physiological activity and the relation between this property and the chemical constitution.

Physiologists may consider that chemists are apt to venture too boldly upon this road, but generalised observations and inductive theorems are always more interesting than a recital of facts, so that even if at times the view which the author takes of the state of our knowledge of the relation between chemical constitution and pharmacological action appears optimistic to some, every one who reads will find stimulus, and the book is calculated to give heart and encouragement to those disposed to enter this difficult field of investigation.

The chapter dealing with narcotics and general anæsthetics gives a lucid explanation of the theory of Overton and Mayer, and that dealing with adrenaline and ethylamine derivatives gives an account of the conclusions drawn by Barger and Dale from the study of the action of amines on the sympathetic system. The former postulates change of permeability of all membranes as a dominant factor, the latter chemical constitution, yet surely there must be in both instances many other unconsidered factors, such as selective action of particular cells owing to differences in their membranes or cell contents, or differences of electrical conditions, colloidal state, surface tension, and so on. Such limits to our present state of knowledge may render deductive reasoning of little value in foretelling the physiological action of a substance either from its physical or chemical properties, nevertheless it does not discourage the investigator who for this very reason may be tempted to chance his luck by submitting to physiological test new compounds of whose activity he might otherwise have no hope. A random instance will illustrate this point. On page 29 *et seq.* we are told that the introduction of acid groups causes a decrease of physiological activity, yet the addition of an acetyl group to choline causes an enormous increase in its activity.

The author has acted wisely in omitting reference to many unimportant drugs which have chiefly emanated from Germany. The book is sufficiently complete, and is readable and interesting throughout. The excellent manner in which the constitutional formulæ are set out adds greatly to the enjoyment of reading it.

FRANCIS H. CARR

TRADE NOTES.

FOREIGN.

Present Position of the Japanese Dye Market.—Our special Correspondent in Japan, writing under date November 2, reports that the prices of dyes have been advanced of late owing to a revived demand from dyers and increasing shortness of foreign supplies. Consignments of dyes from the United States arrive very irregularly and comparatively small quantities are now on offer. French dyes are also in short supply owing to diminished shipping facilities in the Mediterranean. With the exception of artificial indigo supplies of all Swiss colours are growing smaller and smaller. Dyes of home manufacture are coming forward in increasing quantities but are not very highly estimated, sales being dull and prices very low compared with those of foreign dyes.

Among Acid colours, Acid Violet from France is quoted at 55*s.* per lb. and Induline is offered at 23*s.* per lb. From the U.S.A., Acid Red is steadier at 17*s.* 6*d.* per lb. and Acid Blue at 13*s.* 9*d.* per lb., Fast Red is unchanged at 10*s.* 9*d.* per lb. Basic colours arriving from America are Methyl Violet, quoted at 20*s.* 8*d.*, and Chrysoidine at 18*s.* 4*d.* per lb. Bismarck Brown is offered at 3*s.* 10*d.* per lb. Sulphur colours show no change. Among Direct Cotton dyes, Benzopurpurine is practically unchanged at 16*s.* 10*d.* to 18*s.* 4*d.*, Direct Black is offered at 4*s.* 1*d.* Although the home produced dyes are much inferior to imported colours it may be expected that if consumers' demands increase they will rise in price and improve in quality. At the moment everything depends upon the demands of the textile trades for winter costumes.

Trade of Nagasaki (Japan) in 1917.—The trade of this district, more particularly the export trade, increased in 1917, the cutting off of foreign manufactured goods having stimulated a rapid development of home industries. The imports included 5490 tons of coal, 25,126 lb. of brass and bronze, 12,008,375 lb. of unmanufactured iron, 4965 lb. of oxide of cobalt, 15,839 lb. of paraffin wax, 91,709 lb. of zinc, tin valued at $9062, and 33,484 square metres of sheet glass. The exports included 6,934,651 lb. of charcoal, 14,325,191 lb. of Portland cement and 555,525 lb. of paper.

Moji, on the south side of the Straits of Shimonoseki, is the largest port in the district. Its chief imports are raw cotton, raw sugar, machinery and fertilisers, and the exports are mainly wheat flour, sheet glass, coal and cement. The shipments of sheet glass rose from 739,340 sq. metres in 1916 to 17,284,732 sq. metres in 1917; the bulk of it is exported to China and British India to replace the European product now unobtainable.

Wakamatsu exports coal and imports iron ore and pig iron. The Imperial Steel Works, situated in this town, was formerly run at a loss, but is now on a paying basis. The first export of iron manufactures, valued at £147,000, to foreign countries occurred in 1917.—(*U.S. Com. Rep. Suppl., Sep.* 24, 1918.)

Nicaragua in 1917.—There was little improvement in the commercial conditions of Nicaragua in 1917. Before the war, European countries absorbed 60% of the exports of the country and provided over 50% of the imports; now however the United States takes 85% of the exports and provides 81% of the imports.

The following list gives the value of some of the chemical imports together with the countries of origin:—Chemicals, drugs, dyes and medicines, £105,000 (U.S.A. 79%, England 11%, France 6%); explosives, £21,500 (all from U.S.A.); oils, all kinds, £84,000 (principally from U.S.A.); paints and pigments, £5200 (U.S.A. 99%); soap, £16,000 (U.S.A. 63%, England 37%).

The exports are given in the same way:—Cacao, £9100 (U.S.A. 55%); coconuts, £6300 (mainly to U.S.A.); gold (amalgam, concentrates, dust, precipitates and tailings), £193,000 (all to U.S.A.); indigo, £1600 (U.S.A. 54%, England 30%) and silver, £50,000 (mainly to U.S.A.).—*U.S. Com. Rep., Aug.* 19, 1918.)

Calcium Carbide Manufacture in Sweden.—The Alby Carbide Company was founded in 1901, and in 1912 a cyanamide factory was built. In 1914, it manufactured 8000 tons of carbide and 9500 tons of lime. Its shares have hitherto been mainly in English hands, but they have now been purchased, together with those of the Alby Water Falls, by the Stockholm Superphosphate Factory A/B, which commands a capital of £1,117,000.—(*U.S. Com. Rep., Oct.* 18, 1918.)

Imported Dyes in Algeria.—The importation of dyes into Algeria is not large. The Arabs employ them for the bournous, carpets, and other articles which they manufacture, there being no real textile industry in the country. There are three carpet factories, producing 3000 to 4000 carpets annually, the output of which is expected to increase. According to customs statistics, the dyes imported were all obtained from France, but they were of German origin. The quantity imported has fallen from 84 metric tons in 1912 to 56 tons in 1916.—(*U.S. Com. Rep., Oct.* 16, 1918.)

PERSONALIA.

Prof. Percy F. Frankland has resigned the Mason professorship of chemistry at the University of Birmingham, which he has held for nearly twenty-five years.

Mr. J. Uglow Woolcock, general manager of the Association of British Chemical Manufacturers, has been returned unopposed as member of Parliament for Central Hackney.

Mr. T. Roland Wollaston has been awarded the President's gold medal of the Society of Engineers for his paper on "A Survey of the Power By-product Problem" (this J., 1918, 150 R).

EDITORIAL NOTICES.

The Society as a body is not responsible for statements and opinions appearing in the Review.

Hon. Secretaries of Sections are earnestly requested to forward announcements of forthcoming meetings, and reports of past meetings, at the *earliest possible* opportunity.

Publishers are kindly requested to address books, etc., intended for review, also catalogues and announcements of forthcoming publications, to the *Review Editor.*

The Editor would be pleased to consider original articles from Members of the Society and others, with a view to their insertion in the Review. They should be clearly written (preferably type-written) on one side of the paper only, and if a reply is wanted, a stamped and addressed envelope must be enclosed. The Editor would also be pleased to receive relevant news or notes, but the sources of information must always be stated. Contributions of either kind will be paid for, but in the event of duplication only the earliest received and published will be recognised.

To secure prompt attention, all communications concerning the contents of the Review, and notices of forthcoming meetings, should be sent direct to: *The Review Editor, Society of Chemical Industry, Central House, Finsbury Square, E.C.* 2. [*Telephone: London Wall, No.* 2429. *Telegraphic Address: Induchem, Finsquare, London.*]